COMPARISON OF TWO APPROACHES OF SUPRACLAVICULAR BRACHIAL PLEXUS BLOCK FOR UPPER LIMB SURGERIES – LATERAL APPROACH AND SUBCLAVIAN PERIVASCULAR APPROACH

A STUDY OF 60 CASES

DISSERTATION SUBMITTED FOR THE DEGREE OF

DOCTOR OF MEDICINE

BRANCH – X (ANAESTHESIOLOGY)

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THE TAMILNADU DR. M.G.R. MEDICAL UNIVERSITY

CHENNAI,

TAMILNADU

BONAFIDE CERTIFICATE

This is to certify that this dissertation entitled **"COMPARISON OF TWO APPROACHES OF SUPRACLAVICULAR BRACHIAL PLEXUS BLOCK FOR UPPER LIMB SURGERIES – LATERAL APPROACH AND SUBCLAVIAN PERIVASCULAR APPROACH"** is bonafide record work done by **Dr. S. ARUL RAJAN** under my direct supervision and guidance, submitted to the Tamil Nadu Dr. M.G.R. Medical University in partial fulfillment of University regulation for MD, Branch X –Anaesthesiology.

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DECLARATION

I **DR. S. ARUL RAJAN** solemnly declare that this dissertation titled **"COMPARISON OF TWO APPROACHES OF SUPRA CLAVICULAR BRACHIAL PLEXUS BLOCK FOR UPPER LIMB SURGERIES – LATERAL APPROACH AND SUBCLAVIAN PERIVASCULAR APPROACH"** has been done by me. I also declare that this bonafide work or a part of this work was not submitted by me or any other for any award, degree, diploma to any other University board either in India or abroad.

This is submitted to The Tamilnadu Dr. M. G. R. Medical University, Chennai in partial fulfillment of the rules and regulation for the award of Doctor of Medicine degree Branch –X (Anaesthesiology) to be held in April 2012.

Place: Madurai DR. S. ARUL RAJAN

Date:

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CONTENTS

INTRODUCTION

Peripheral nerve blocks are gaining widespread popularity for perioperative pain management because of their distinct advantages over General anaesthesia and Central neuraxial anaesthesia.

Pain relief with Peripheral nerve block is devoid of side effects such as somnolence, hemodynamic instability, postoperative nausea, vomiting, and voiding difficulties inherent to General anaesthesia and Central neuraxial anaesthesia. Patient who undergoes surgery under Peripheral nerve blocks can bypass recovery room and be expeditiously discharged following outpatient surgery.

Patient can position themselves on the operating table with little risk to the loss of airway and minimal personnel effort. High degree of patient and surgeon satisfaction results because of superior pain control with minimal side effect.

In 1911, Kullenkampff introduced the classic supraclavicular approach of brachial plexus block. Winnie and Collins introduced the subclavian perivascular approach of brachial plexus block. Moorthy introduced the modified lateral paravascular approach of supraclavicular brachial plexus block. In recent years however, the technique has had resurgence, due in large part to increased understanding of neural plasticity

and the possibility of minimizing hospital stay length by effective use of Regional Anaesthesia.

Several technique have been used to prolong the duration of regional anaesthesia. Besides the continuous infusion of local anaesthetics through catheters and recently opioids as adjuvants to local anaesthetic solutions, the addition of epinephrine appears to be the most widely used.

PERIPHERAL NERVE STIMULATORS

Until recently, elicitation of paraesthesia has been a classical method to locate nerves for peripheral nerve blocks. Peripheral nerve stimulator technology utilizes objective end points for nerve localization and does not depend on patient's cooperation for effective nerve localization.

An effective use of peripheral nerve stimulator technology mandates 1. Knowledge of anatomy with respect to optimal needle insertion site to achieve needle tip–target nerve contact. 2. Muscle innervations scheme of the targeted nerve to identify desire Evoked Motor Response. 3. Ability to differentiate desired Evoked Motor Response from the alternate Evoked Motor Response elicited by the stimulation of adjacent muscles and collateral nerves and the relationship of the adjacent neuromuscular structures generating these alternate Evoked Motor Response to the targeted nerve.

Therefore an algorithm can be designed for needle redirection during Peripheral Nerve Stimulator assisted Peripheral Nerve Block.

This study attempts to compare the clinical efficacy of supraclavicluar block by Lateral Approach and subclavian perivascular approach of brachial plexus block by using the peripheral nerve stimulators.

AIM OF THE STUDY

To evaluate the success rate as well as quality of blockade and clinical efficacy of the LATERAL APPROACH comparison with SUBCLAVIAN PERIVASCULAR approach of brachial plexus block for upper limb surgeries and both approach guided by peripheral nerve stimulators.

HISTORY

Brachial plexus nerve block was performed first by HALSTED in 1884 When he “freed the cords and nerves of the brachial plexus, after blocking the roots in the neck with cocaine solution”.

In 1887, CRILE disarticulated a shoulder joint after rendering a patient’s arm insensitive by blocking the brachial plexus by direct intraneural injection of each nerve trunk with 0.5% cocaine under direct vision.

In 1911, HIRSCHEL and KULENKAMPFF,working independently, were the first to inject the brachial plexus percutaneously, (blindly through the skin), without exposure of the nerve.

1. G. Hirschel performed first percutaneous axillary brachial plexus block
2. D. Kulenkampff performed supraclavicular brachial plexus block
3. 1943 – Lidocaine was synthesized by Lofgreen and Lundquvisit
4. 1956 – Bupivacaine synthesized by Ekenstam
5. 1963 – Bupivacaine introduced clinical practice by Telivuo

ANATOMICAL CONSIDARATIONS

The Brachial Plexus

Knowledge of the formation of brachial plexus and of its distribution is absolutely essential to the intelligent and effective use of brachial plexus anaesthesia for surgeries of the upper limb. Close familiarity with the vascular, muscular and fascial relationships of the plexus throughout its formation and distribution is equally to the mastery of the various techniques of brachial plexus anesthesia.

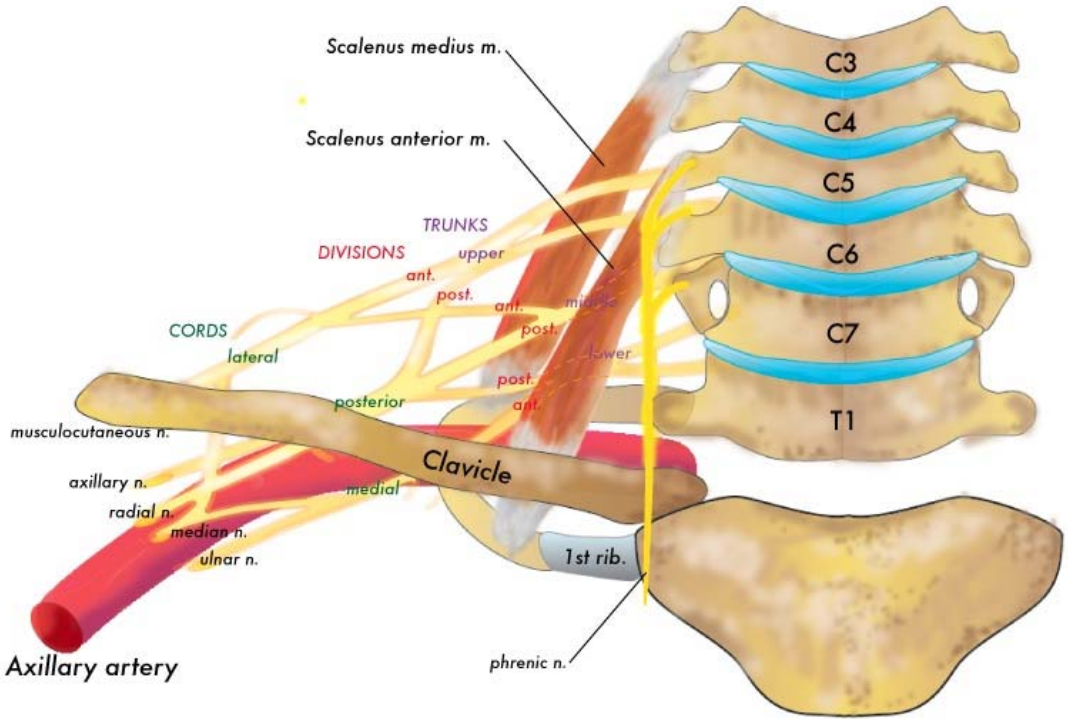
In its course from the intervertebral foramina to the upper arm, the fibres that constitute the plexus are composed consecutively of roots, trunks, divisions, cords and terminal nerves and branches.

FORMATION OF PLEXUS

Roots

The plexus is formed by the anterior primary rami of the 5^{th} to 8^{th} cervical nerves, together with the bulk of the 1^{st} thoracic nerve (C5-8 and T1). In addition there is frequently a contribution above from C4 to the 5^{th} cervical root and another below fromT2 to the 1^{st} thoracic nerve. Occasionally the plexus is mainly derived from C4 -8 (Pre –fixed plexus) or from C6 – T2 (post – fixed plexus.

BRACHIAL PLEXUS



Trunks

The five roots of the plexus emerge from the intervertebral foramina. They lie in the gutter between the anterior and posterior tubercles of the corresponding transverse process. All five roots they become sandwitched between scalenus anterior and medius. Here the roots of C5 and C6 unite into the upper trunk. The root of C7 continues as the middle trunk and those of C8 and T1 into the lower trunk. Each trunk divides behind the clavicle, into anterior and posterior divisions, which unite in the axilla to from the cords.

Cords

The six division stream into the axilla and there join up into three cords, Lateral, Medial and Posterior, these cords are composed as follows:

1. **Lateral cord** formed by fusion of anterior division of upper and middle trunk (C5-C7)
2. **Medial cord** represents the continuation of the anterior division of the lower trunk (C8 & T1)
3. **Posterior cord** comprises of all three posterior divisions (C5-C8 & T1)

The composition of the brachial plexus can be summarized as follows:

1. **Five roots** – the anterior primary rami of C5 – 8 and T1

2. **Three trunks.**

    a) Upper trunk, C5 and C6

    b) Middle trunk, C7 alone and

    c) Lower trunk, C8 and T1

3. **Six division** – each trunk divides into an anterior and posterior division

4. **Three cords**

a) **Lateral cord** formed by fusion of anterior division of upper and middle trunk (C5-C7)

b) **Medial cord** formed by anterior division of the lower trunk (C8 & T1)

c) **Posterior cord** formed by the union of the posterior division of all three trunks (C5-C8 & T1).

The Relations of the brachial plexus

Roots

Lie between the scalenus anterior and medius, The roots of the plexus lie above the second part of the subclavian artery.

Trunks

The upper and middle trunks lie above the subclavian artery as the stream across the 1st rib, but the lower trunk lies behind the artery and may groove the rib immediately posterior to the subclavian groove.

Division

At the lateral border of the 1st rib the trunks bifurcate into divisions, which are situated behind the clavicle.

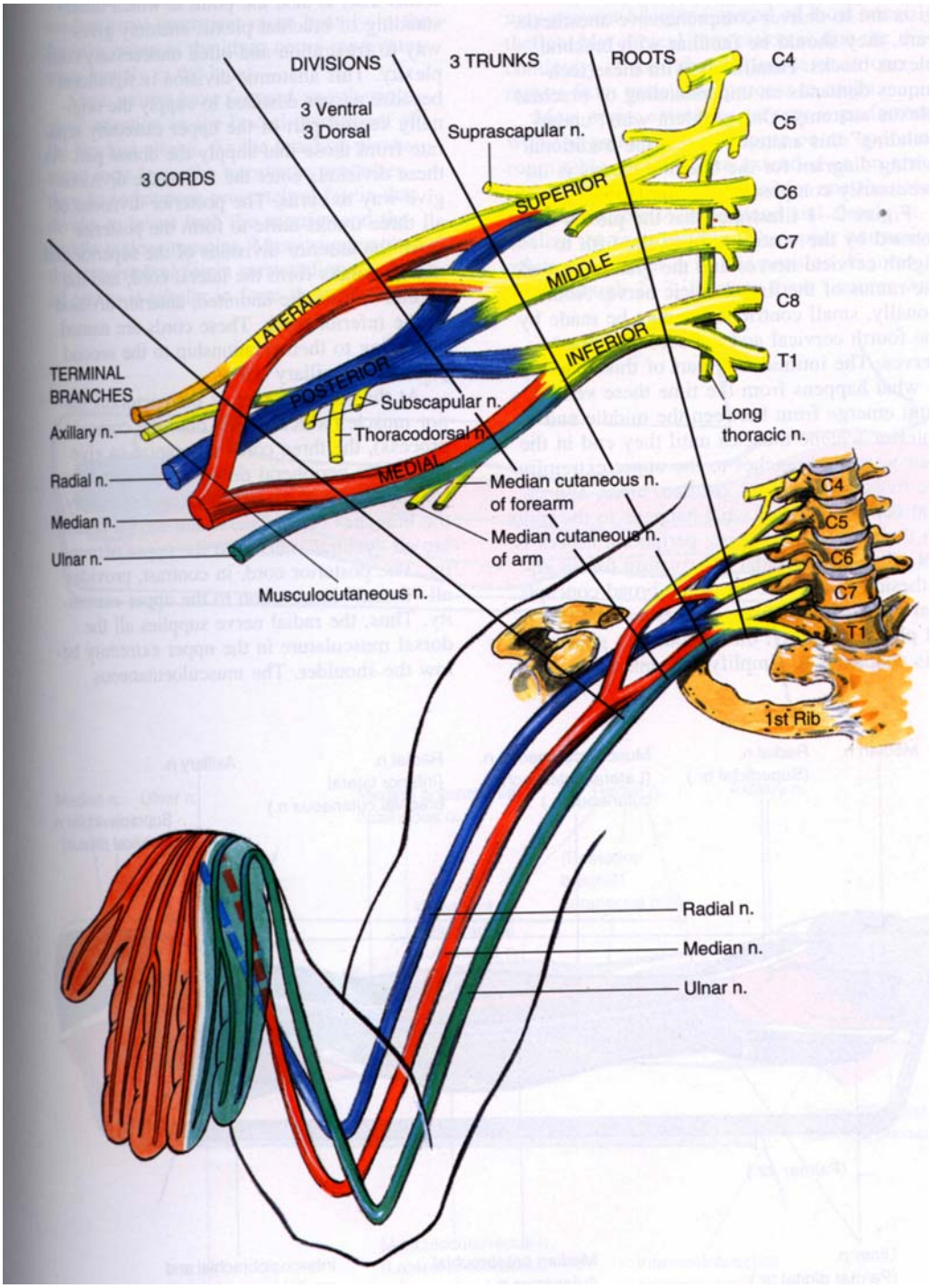
Cords

The cords are formed at the apex of the axilla and become grouped around the axillary artery.

The inter scalene sheath

As the roots C5 – T1 emerge in the groove between the transverse process tubercle, they lie in a fibro – fatty space between the two scheaths of fibrinous sheath. Posterior sheath from posterior tubercles covers the front of medius. Anterior sheath from anterior tubercles covers the posterior aspect of scalenus anterior. The sheath extends into the axilla around the plexus. Significance of this space is that the local anaesthetic can be injected to produce block either by interscalene, subclavian perivascular or axillary approach.

BRACHIAL PLEXUS - BRANCHES



Sympathetic Supply

Close to the emergence, the 5th and 6th cervical nerves, each receive a grey ramus from the middle cervical sympathetic ganglion. The 7th and 8th cervical nerves, each receive a grey ramus from the inferior cervical ganglion.

Branches

Branches are given from

1. Roots
2. Trunks and
3. Cords

1. Branches from the Roots

a. Nerve to the serratus anterior (C5, C6 and C7)

b. Muscular branches to

i. Longus cervices (C5- C8)

ii. Three scalene (C5 – C8)

iii. Rhomboids (C5)

c. A twig of Phrenic nerve (C5)

2. Branches from the trunks

a. Suprascapular nerve (C5, C6)

b. Nerve to subclavius (C5, C6)

BRANCHES FROM THE CORDS

1. Lateral cord - (C5 – C7)

i. Lateral pectoral nerve

ii. Lateral head of median nerve

iii. Musculocutaneous nerve

2. Medial cord – (C8 & T1)

i. Medial pectoral nerve

ii. Medial head of median nerve

iii. Medial cutaneous nerve of arm

iv. Medial Cutaneous nerve of forearm

v. Ulnar nerve

3. Posterior cord – (C5 – 8 & T1)

i. Upper subscapular nerve

ii. Lower subscapular nerve

iii. Nerve to latissimus dorsi

iv. Axillary nerve

v. Radial nerve

Anatomic consideration of the Interscalene space

The roots of the Brachial plexus, after leaving the transverse process of the corresponding cervical vertebra, descend in between the scalenus anterior and medius in the posterior triangle of neck.

Scalenus anterior arises from the anterior tubercles of the transverse processes of theC3 – C6 vertebra. It is inserted into the scalene tubercles on the inner border of the first rib. The muscle lies anterior to the plexus and at its insertion lies anterior to the subclavian artery that separates the plexus from its insertion. Scalenus medius arises from the posterior tubercles of the upper surface of the first rib behind the plexus and subclavian artery. Thus the plexus lies in the front of the muscle.

Techniques of brachial plexus block

Surgical anaesthesia of the upper extremity and shoulder can be obtained following neural blockade of the brachial plexus at several sites. The various approaches that can be used for this blockade are as follows.

1. Interscalene approach
2. Supraclavicular approach
    a. Classic supraclavicular approach of Kulenkampff
    b. Subclavian perivascular approach of Winnie and Collins.
    c. Plumb – bob technique.

d. Modified Lateral paravascular approach of Moorthy.

3. Infraclavicular approach

4. Axillary approach

1. Interscalene Brachial Plexus Block

The interscalene groove is to be located. By standing at the side of the patient, after locating the interscalene groove, an intradermal wheal is raised at the point of needle insertion, which is at the level of the cricoid cartilage. A 22G, 3.5cm short bevel needle is inserted dorsal to the horizontal plane. The fascial sheath is entered with a 'pop'. The needle is advanced slowly until paraesthesia is elicited in the distribution of arm or hand. The local anaesthetic is injected slowly after repeated negative aspiration, after careful aspiration to detect inadvertent entry into the vertebral artery or dural cuff.

Complications

1. Subarachnoid injection
2. Epidural blockade
3. Intravascular injection (into vertebral artery)
4. Pneumothorax
5. Phrenie nerve block

2. Supraclavicular Brachial Plexus Block

A) Classic Supraclavicular Block

In the classic approach, the needle insertion site is approximately 1cm above and the midpoint of clavicle. The needle and syringe are inserted in a plane parallel to the patient's neck and head. The needle will contact the rib at a depth of 3 to 4 cm. The needle is worked over the rib until paraesthesia are elicited. After careful aspiration, the local anaesthetic drugs are injected.

B) Subclavian Perivascular Technique

The interscalene groove is palpated at its most inferior point, which is just posterior to the subclavian artery pulse. The needle is directed just above and posterior to the subclavian pulse and directed caudally at a very flat angle against the skin. The needle is advanced until paraesthesia is elicited and the local anaesthetic is injected after careful aspiration.

C) Plumb bob Supraclavicular Block

The brachial plexus at the level of the first rib lies posterior and cephalic to the subclavian artery. Once this skin mark has been placed immediately superior to the clavicle at the lateral border of the sternocleidomastoid muscle as it inserts into the clavicle, the needle is inserted at a 90^0 angle to the tabletop. The local anaesthetic is injected

after elicitation of paraesthesia. The name 'Plumb Bob' was chosen for this technique since if one suspends a plumb bob over the entry site, needle insertion through the point would result in contact with the brachial plexus in most patients.

D) Lateral approach

The insertion point for this Lateral approach is 1cm above, at a junction of inner $2/3^{rd}$ and outer $1/3^{rd}$ of the clavicle. The point is about 1cm medial to the border of trapazius muscle. The path is behind the omohyoid muscle and parallel to clavicle in the interscalene plane between anterior scalene and medial scalene muscle. The omohyoid muscle can be identified by rolling the index finger in the posterior triangle of the neck in normal built patients though it is not obvious in all patients.

Needle inserted through the directed medially and towards the plane of the interscalene space at an angle of 20^0 to the skin, parallel to clavicle deep to the external jugular vein. Contraction of the forearm muscles or biceps was obtained at an electrical intensity of 0.4 – 0.6mA. Once the nerve plexus is located, local anaesthetics injected slowly after negative aspiration, A gentle pressure at the area was given to make uniform spread.

Complications

Pneumothorax, Hemothorax

Horner's Syndrome

Phrenic nerve block

Haematoma formation.

4. **Infraclavicular Brachial plexus Block**

a. **Classical approach:** The needle is inserted 2cm below the midpoint of the clavicle, it is then directed laterally from this site at a 45^0 angle away from the chest wall and toward the humeral head or coracoid process. Once a paraesthesia is elicited, the local anaesthetic is injected after negative aspiration.

b. **Coracoid approach:** The needle is inserted perpendicular to the floor, at the site of 2cm medial and 2cm caudal from the coracoid process until paraesthesia elicited or nerve stimulator used after satisfactory motor response. The local anaesthetic is injected after negative aspiration.

Complications

Pneumothorax

Hemothorax

Chylothorax (with a left sided block)

d) Axillary Brachial plexus Block

i. Paraesthesia technique

The pulsation of the axillary artery at the level of the lateral border of the pectoralis major is palpated. The needle is inserted just superior to the artery until the resistance of the fascial sheath is felt and 'Pop' indicated the correct needle placement. After negative aspiration, local anaesthetic solution is injected using digital pressure distal to the needle to encourage proximal spread.

ii. Transarterial technique

The axillary arterial pulse should be indentified as proximal as possible. The needle is inserted until bright red blood aspirated. The needle is then advanced further no additional blood aspirated. The local anaesthetic is injected in 5ml increments posterior to the artery.

Complications

Intra arterial injection

Post operative neuropathy

Haematoma

Infection

PHYSIOLOGICAL CONSIDERATIONS

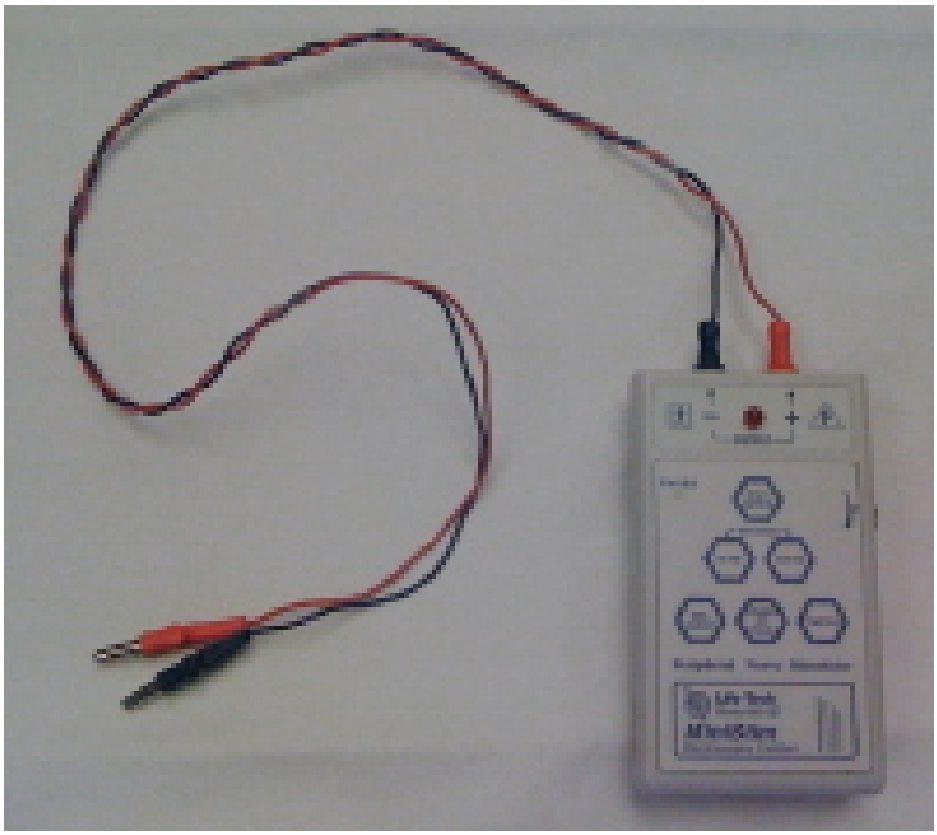
Basic of peripheral nerve stimulator technology

Nerve stimulation was first described by Perthes in 1912. Electrical nerve stimulation of peripheral nerve is more commonly used in clinical practice. The ability of a nerve stimulator to evoke a motor response depends on the intensity, duration, and polarity of the stimulating current used and the needle (stimulus) – nerve distance. To propagate a nerve impulse, a threshold current must be applied to the nerve fibre. Peripheral nerve stimulation is typically performed using a rectangular pulse of current. When a square pulse of the current strength and the duration of pulse.

RHEOBASE-is the minimal threshold current required to stimulate a nerve with along pulse width.

CHRONAXIE-is the duration of the stimulus required to stimulated at twice the rheobase. Chronaxie is used to express the relative excitabilities of different tissues. It is possible to stimulated A- alpha (motor) fibres without stimulating A-delta and C fibres that transmit pain. Moreover, mixed nerves can be located by evoking a motor response without causing patient discomfort. Stimulation intensity will be variable as determined by coulomb's law [$e=k\ (q/r^2)$, k-constant, q minimum

PERIPHERAL NERVE STIMULATOR



stimulating current, r-distance of the needle tip from the nerve]. A very high stimulus current is required to stimulate the nerve when the needle tip is far away from the nerve. If the distance is great, the strength of the stimulus required to stimulate the nerve may produce significant pain and systemic effects. An Evoked Motor Response at a stimulating current of <0.5mA is associated with high rates of success of Peripheral Nerve Stimulator assisted Peripheral Nerve Block.

Characteristics of an ideal Peripheral Nerve Stimulator

Constant current output - A particular current not the voltage stimulates the nerve. Therefore, the current delivered by the device should not vary with changes in the resistance of the external circuits.

1. Digital display of the delivered current
2. Variable output control
3. Clearly identifiable control
4. Option for different pulses
5. A wide range of current output 0.1-5.0mA
6. Battery indicator

Peripheral nerve stimulator settings

Mixed nerves (most Peripheral Nerve Block)

Current (dial) - > 1mA

Current duration-0.1ms

Frequency->1-2Hz

Sensory nerve (eg-Lateral femoral cutaneous and saphenous nerves)

Current (dial)->2-5mA

Current duration -1ms,

Frequency- 1Hz

Diabetic neuropathy (Peripheral Nerve Block)

Current (dial) -> 2mA

Current duration -> 0.3ms

Frequency - >1-2HZ

PERIPHERAL NEUROANATOMY

C and A∂ fibres are the main peripheral nociceptors. The skin joints and periosteum are richly innervated with C and A ∂ nociceptors as well as the non nociecptive Aß sensory fibres.

A ∂ are responsible for the sensation of first pain, the initial sharp pain experienced following an injury. C fibres are unmyelinated and are responsible for second pain, the slowly building throbbing, burning pain experienced following an injury.

Classification of Sensory Fibers

Sensory receptors	Speed of transmission	Sensory function	Myelination
A-α	70 -120m/sec	Noxious chemical thermal, mechanical stimuli, (sharp fast, first pain)	Lightly myelinated
A-ß	30 -70m/sec	Nonpainful, light,touch, pressurs, vibration proprioception	Heavily myelinated
A-γ	30-70m/sec	Proprioception/Motor to muscle spindle	Myelinated
A-δ	12-30 m/sec	Pain, cold, touch	Myelinated
B	3 -15 m/sec	Pre ganglionic autonomic (sympathetic)	Myelinated
C	0.5 -2m/sec	Noxious chemical, Mechanical, thermal activation (Slow burning second pain)	Unmyelineated

Peripheral neurochemistry and neurotransmitters:

Commonly released inflammatory mediators implicated in pain and hyperalgesia include Bradykinins, potassium, substance P, cytokines, histamine, serotonin, prostaglandins. These peripheral neurotransmitters either activate or sensitise the peripheral noiceptors to pain.

PHARMACOLOGY

Local Anaesthetics: LIGNOCAINE HYDROCHOLORIDE

Lignocaine was synthesized in 1943 in Sweden by Loffgren of AB Astra. It is chemically a tertiary amide, diethyl aminoacetyl, 2.6, xylidine hydrochloride monohydrate. It is a local anaesthetic of moderate potency and duration but of good penetrative powers and rapid onset of action.

It is a stable compound at room temperature. Adrenaline prolongs the action of lignocaine and reduces the rate of systemic absorption by producing vasoconstriction and also reduces the systemic toxicity. Tachyphylaxis can occur with repeated injections. Concentration of adrenaline added is 5µgm / ml (1:2,00,000 dilution).

Mechanism of action

Lignocaine prevent transmission of nerve impulses by inhibiting passage of sodium ions through ion-selective sodium channels in the nerve membranes. This slows the rate of depolarization such that the threshold potential is not reached and thus action potential is not propagated. But resting membrane potential is not altered. Lignocaine binds to the inner portion receptor (i.e Sodium channel) after entering the cell membrane.

Pharmacokinetics

Molecular weight	:	271
Pka	:	7.8
Protein binding	:	70%
Lipid solubility	:	2.9
Volume of distribution	:	91 liters
Clearance	:	0.95 litres / minute
Elimination half life	:	96 minutes
Toxic plasma concentration:		>5 microgram /ml

Metabolism

The principle metabolic pathway of Lidocaine is oxidative dealkylation in Liver to monoethylglycine xylilide followed by hydrolysis of this metabolite to xylidide. Hepatic disease can decrease the rate of metabolism of Lidocaine.

Dose: **Safe dose:** 3mg/kg without adrenaline

7mg/kg with adrenaline

Adrenaline up to 5µgm /ml (1in 2,00,000) dose not give rise to systemic effects Blood concentration of local anaesthetic drug is highest following intercostals block followed in order of decreasing concentration, epidural, Brachial plexus block and subcutaneous infiltration.

Toxicity

Allergic reactions: Due to the methyl paraben or similar preservatives that are structurally similar to para aminobenzoic acid and allergic reactions are due to antibody stimulation by the preservative.

Central nervous system: numbness of tongue and circumoral tissues restlessness, vertigo, tinnitus slurred speech skeletal muscle twitching, Tonic clonic seizures, Central nervous system depression, hypotension, apnoea, Seizures are produced by selective inhibition of the inbibitory neurons of Central nervous system leaving unopposed excitatory neuron activity, transient radicular irritation (with 5% hyperbaric lignocaine) Cauda equine syndrome.

Cardiovascular System

Plasma concentrations 5-10µgm/ml can produce profound hypotension due to relaxation of arteriolar smooth muscle and direct myocardial depression.

Therapeutic uses

1. Topical anaesthesic (2-4%)
2. EMLA Cream (Lignocaine 2.5% with Prilocaine 2.5%)
3. Local infiltration and peripheral nerve block
4. Intravenous regional anaesthetic (Biers block)

5. Regional anaesthetic (Spinal / epidural)
6. Stress attenuation and prevention of rise in intra cranial tension
7. Suppression of the ventricular arrhythmias.
8. Reflex induced bronchospasm is also attenuated by intravenous administration of lignocaine
9. Used intravenously as an analgesic for certain chronic pain states
10. Used as a supplement to general anaetheisa.

Contraindications:

1) Hypersensitivity
2) Should not be used with vasoconstrictor in digits of hand, feet and penis
3) Stokes Adams syndrome, severe degree of heart block

BUPIVACAINE

It is a widely used amide local anaesthetics. Structure is similar to lignocaine except that the amine containing group is butylpiperidine. Levobupivacaine the s - enantiomer of bupivacaine is also available with less cardio toxicity.

Mechanism of action

Binds to specific sites located on the inner portion of sodium channels as well as obstructing sodium channels near their external openings to maintain these channels in inactivated closed states.

Pharmacokinetics:

Pka	:	8.1
Protein binding	:	95%
Clearance	:	0.47 Liters/minutes
Volume of distribution	:	0.9 – 0.4 liters /kg
Half life	:	1.2 – 2.4hours
Peak time of action	:	0.15 – 0.5 hours
Peak plasma concentration	:	0.8 µgm /ml
Toxic plasma concentration	:	> 3 µgm/ml

Most important plasma protein binding site is α1 acid glycoprotein.

Metabolism

Metabolized in the liver by aromatic hydroxylation, N-dealkylation, amide hydrolysis and conjugation. Metabolite is N-dealkylated desbutyl bupivacaine

Dose: 3mg/kg

Therapeutic Uses

Spinal and Epidural anaesthesia

Peripheral nerve blocks & Infiltration analgesia

Toxicity

More cardio toxic than equieffective dose of lidocaine. Manifested clinically as ventricular and myocardial depression after inadvertent intra vascular administration of Bupivacaine.

Mechanism of toxicity

Although both lignocaine and Bupivacaine block cardiac sodium channels during systole, Bupivacaine dissociates more slowly than lignocaine and therefore significant fraction of sodium channels remain block during diastole. Thus the block is cumulative and substantively more than would be predicted by its local anaesthetic potency. A percentage of its cardiac toxicity is centrally mediated. Toxicity is enhanced by acidosis, hypoxemia, hypercarbia.

ADRENALINE (Epinephrine)

Adrenaline 1in 2,00,000 concentration (5µgm/ml) added to Local anesthetics to reduce vascular absorption and local anaesthetic toxicity. Duration of both sensory and motor blockade is increased by addition of adrenaline to lignocaine but, only sensory block is prolonged if adrenaline is added to bupivacine with no effect on motor blockade.

Adrenaline should not be used in

1. Ring block of fingers, toes, penis, pinna and nose.
2. Mycocardial ischemia patient.
3. Severe hypertensives.
4. Hyperthyroid patient.
5. Intravenous regional anaesthesia (Bier's block).

REVIWE OF LITERATURE

1) **Indian Journal of Anaesthesia – vol.54 Issue 3: May-Jun 2010**

LATERAL APPROACH for supraclavicular brachial plexus block

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A Lateral approach described by Volker Hempel and Dr. Dilip Kothari has been further studied, evaluated and described in detail in the present study.

The aim of this study was to evaluate lateral approach of supraclavicular brachial plexus block, mainly in terms of success rate and complication rate, the study was conducted in secondary level hospital and tertiary level hospital from 2004 to 2008. It was a prospective non randomized open level study. Eighty two patients of both sexes, aged between 18 and 65 years with ASA Grade I and II scheduled to undergo elective major surgery of the upper limb below the midarm, were selected for this new lateral approach of brachial plexus block.

The onset and duration of sensory and motor block, any complications and need for supplement anaesthesia were observed.

Success and complication rate were calculated in percentage. Average onset and duration of sensory and motor block was calculated as mean ± SD and percentage. Out of 82 patients, 75 (92%) have got successful block with no significant complication in any case.

Supraclavicular brachial plexus block by lateral approach associated with minimal adverse effect in comparison to any other supraclavicular approach and more effective with high success rate also.

2) **Indian J. Anaesth, 2003, 47 (4): 287 -288**

Supraclavicular Brachial plexus block: A new approach

Dr. Dilip Kothari

250 patients between the ages of 18 – 50 years who underwent upper limb surgeries were given supraclavicular brachial plexus block by LATERAL APPROACH. In this technique a 5 cm long 22 SWG needle was inserted from a point 1 cm above the junction of inner 2/3 and outer 1/3 of clavicle directed medially, inwards and parallel to clavicle at an angle of approximately 20^0 to the skin.

All the patients had pressure paraesthesia and immediate pain relief after 20ml solution of mixture of 10ml of 2% lignocaine, 6 ml of 0.5% bupivacaine and 4ml normal saline was injected.

Average onset and duration of analgesia was 3 minutes and 180 – 200 minutes respectively. Average onset and duration of motor loss was 6-8 minutes and 120 – 150 minutes respectively. 6% cases had vessel puncture but no serious complications were noticed.

Quick and complete analgesia and motor loss with no serious side effect were the main features of this approach.

3) **1992 American Society of Regional Anaesthesia and Pain Medicine Brachial Plexus Block with the Nerve Stimulator:** Motor Response Characteristics at Three Sites.

Differences in motor response patterns, minimum electrical currents, and success rates using a nerve stimulator for brachial plexus block were determined for the interscalene, supraclavicular, and axillary approaches.

Localization of the brachial plexus with the nerve stimulator is equally effective at the interscalene, supraclavicular, and axillary sites. Current values in the range reported have no predictive value for success. Advantages of the nerve stimulator for brachial plexus block include an objective endpoint and continuous feedback.

4) **1994 American Society of Regional Anesthesia and Pain Medicine**

Brachial Plexus Block: A Comparison of the Supraclavicular Lateral Paravascular and Axillary Approaches.

Anesthesia of the brachial plexus has been associated with injuries to adjacent structures (e.g., pneumothorax, vascular penetration). It is not uncommon to have only partial block of the upper extremity, hindering completion of the surgical procedure. The supraclavicular lateral paravascular approach to brachial plexus anesthesia has been proposed as an effective, safe alternative to the traditional approaches to brachial plexus anesthesia.

This prospective, randomized study sought to determine if the supraclavicular lateral paravascular (SCLP) approach is as effective as the transarterial axillary approach, the most common brachial plexus block used at our institution.

16/20 (80%) of SCLP blocks were good. 13/20 axillary blocks were good. The success rate with the SCLP approach was 95%. The success rate with the axillary approach was 90%.

The supraclavicular lateral paravascular approach is as effective as the axillary approach.

5) **Fleck JW, Moorthy SS, Daniel J, Dierdorf SF. Department of Anesthesia, Indiana University Medical Center, Indianapolis.** Brachial plexus block: A comparison of the supraclavicular lateral paravascular and axillary approaches.

The success rate with the SCLP approach was 95%. The success rate with the axillary approach was 90%.

The supraclavicular lateral paravascular approach is as effective as the axillary approach.

6) **Mariano ER, Sandhu NS, Loland VJ, Bishop ML, Madison SJ, Abrams RA, Meunier MJ, Ferguson EJ, Ilfeld BM.** Department of Anesthesiology, UCSD Center for Pain Medicine, University of California-San Diego, 9300 Campus Point Drive, La Jolla, CA 92037-7651, USA.

A randomized comparison of infraclavicular and supraclavicular continuous peripheral nerve blocks for postoperative analgesia. A local anesthetic infusion via an infraclavicular perineural catheter provides superior analgesia compared with a supraclavicular perineural catheter.

7) **European Journal of Anaesthesiology: Volume 17, Issue 2, pages 120–125, February 2000**

Brachial plexus block using a new subclavian perivascular technique: the proximal cranial needle approach

Department of Anaesthesia, Centro Traumatologico Ortopedico, Careggi, Firenze, Italy, Dr P. Pippa, Via A Righi, 28, I-50047 Prato, Italy.

We describe the proximal cranial needle approach for brachial plexus blockade; clear surface markings and cranial direction of the needle lead to satisfactory results with a low incidence of complications.

8) **PubMed - indexed for MEDLINE Dalens B, Vanneuville G, Tanguy A. Department of Anesthesiology, Clermont-Ferrand, France.** A new parascalene approach to the brachial plexus in children: comparison with the supraclavicular approach.

A technique for blocking the brachial plexus was designed after reevaluation of the gross anatomy of the neck in children. It consists of penetrating the perineural sheath at the level of the omohyoid muscle using a strictly anterior-posterior direction for insertion of the needle. This procedure was prospectively evaluated in 60 children (group P) and compared with classical supraclavicular approach in 60 similar patients

(group S). Insulated needles and a nerve stimulator were used with both techniques.

Although both techniques produced a high degree of sensory blockade in almost all infraclavicular branches of the brachial plexus, the parascalene approach proved to be easier and more reliable while also being almost free of complications.

9) **Regional Anesthesia and Pain Medicine, Volume 25, Issue 1, Pages 41-46: C.Franco, Z.Vieira.** 1,001 subclavian perivascular brachial plexus blocks: Success with a nerve stimulator

Nine hundred seventy-three blocks (97.2%) were completely successful; 16 blocks (1.6%) were incomplete and needed supplementation; and 12 blocks (1.2%) failed and required general anesthesia, giving a success rate for regional anesthesia of 98.8%.

The subclavian perivascular block consistently provides an effective block for surgery on the upper extremity. At the site of injection with this technique, the plexus is reduced to its smallest components and the sheath is reduced to its smallest volume, which explains in great part the success obtained with this block. We believe that we have demonstrated a nerve stimulator technique that is both highly successful and safe; no

clinical pneumothorax was found nor did any other major complications develop.

10) **Nguyen Hoang C, Fath Erwin, Wirtz Sebastian, et al. Anesth. Analg. Sep 2007;105:872-5**

Transscalene Brachial Plexus Block: a New Posterolateral Approach for Brachial Plexus Block.

Depending on the approach to the upper brachial plexus, severe complications have been reported. We describe a novel posterolateral approach for brachial plexus block which, from an anatomical and theoretical point of view, seems to offer advantages. Twenty-seven patients were scheduled to undergo elective major surgery of the upper arm or shoulder using this new transscalene brachial plexus block. The success rate was 85.2% for surgery. Two patients required additional analgesia with IV sufentanil. In two others, regional anesthesia was inadequate.

The side effects of this technique included reversible recurrent laryngeal nerve blockade in two patients and a reversible Horner syndrome in one patient. Further studies are needed to compare the transscalene brachial plexus block with other approaches to the brachial plexus.

11) **Regional Anesthesia and Pain Medicine, Vol 27, No 4 (July–August), 2002: pp 402–428.**

Brachial Plexus Anesthesia: Essentials Of Our Current Understanding

Joseph M. Neal, M.D., James R. Hebl, M.D., J. C. Gerancher, M.D., and Quinn H. Hogan, M.D.

12) **Anaesthesia and analgesia vol: 60 (page 352 to 355) – No.5: May 1981** Volker Hempel, MD," Meno van Finck, MD,f and Elmar Baumgartnerf.

A Longitudinal Supraclavicular Approach to the Brachial Plexus for the Insertion of Plastic Cannulas.

13) **Dupré LJ, Danel V, Legrand JJ, Stieglitz P.** Surface landmarks for supraclavicular block of the brachial plexus.*Anesth Analg*1982;61:28-31

14**) Brown DL,Cahill DR, Bridenbaugh LD.** Supraclavicular nerve block: anatomic analysis of a method to prevent pneumothorax. *Anesth Analg* 1993; 76 : 530-4.

15) **Winnie AP, Collins VJ.** The subclavian perivascular technique of brachial plexus anesthesia. *Anesthesiology* 1964; 25 : 353-63.

16) **Lanz E, Theiss D.** Evaluation of brachial plexus block. Comparison between supraclavicular and interscalene approach. *Anaesthesist* 1979;28 : 57-62.

MATERIALS AND METHODS

This is a prospective randomized study conducted at Government Rajaji Hospital, attached to Madurai Medical College, Madurai. Sixty patients of ASA grade I&II of either sex under going upper limb surgeries (mostly orthopedic, plastic surgeries) were randomly allocated into two groups I and II. Each group comprises of 30 patients. Surgery was done under Lateral approach of Brachial plexus Block in group I and under subclavian perivascular approach of Brachial plexus block in group II.

Procedure

After ethical committee approval informed consent was obtained from the patients. Intravenous access was obtained. Anaesthesia machine checked resuscitative equipments and drugs were kept ready.

Inclusion criteria

Age > 18 yrs

Both sex

ASA I – II undergoing surgery for both elective / emergency

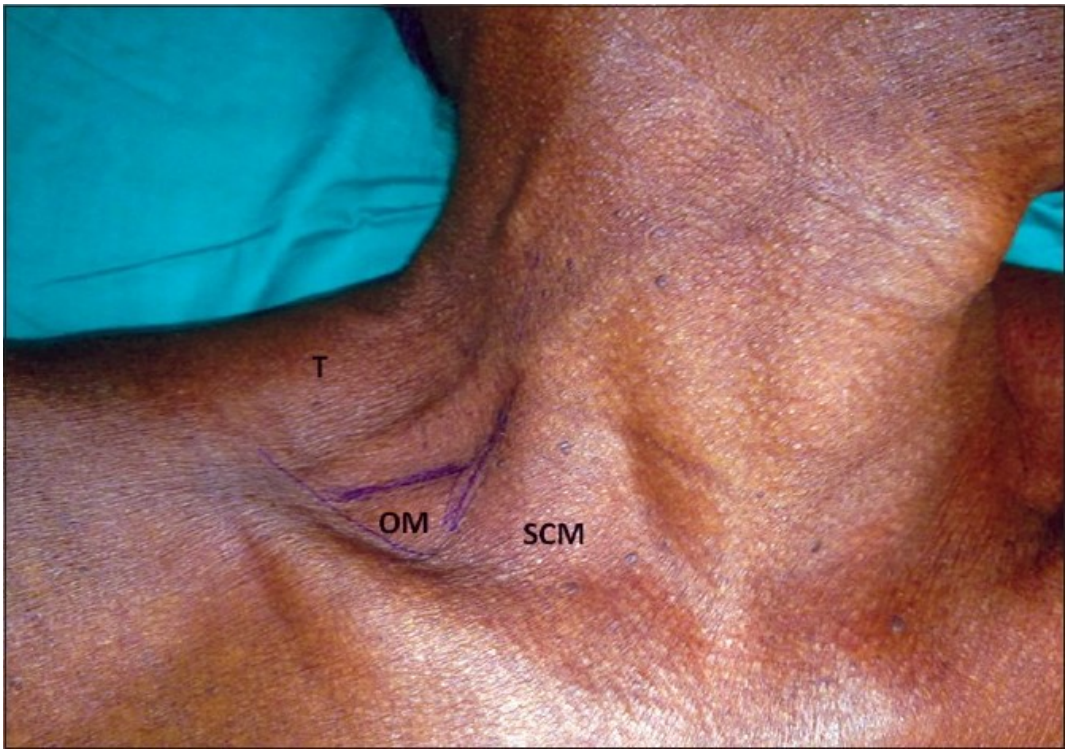
Hand, wrist, Fore arm, elbow and lower 1/3rd of Arm.

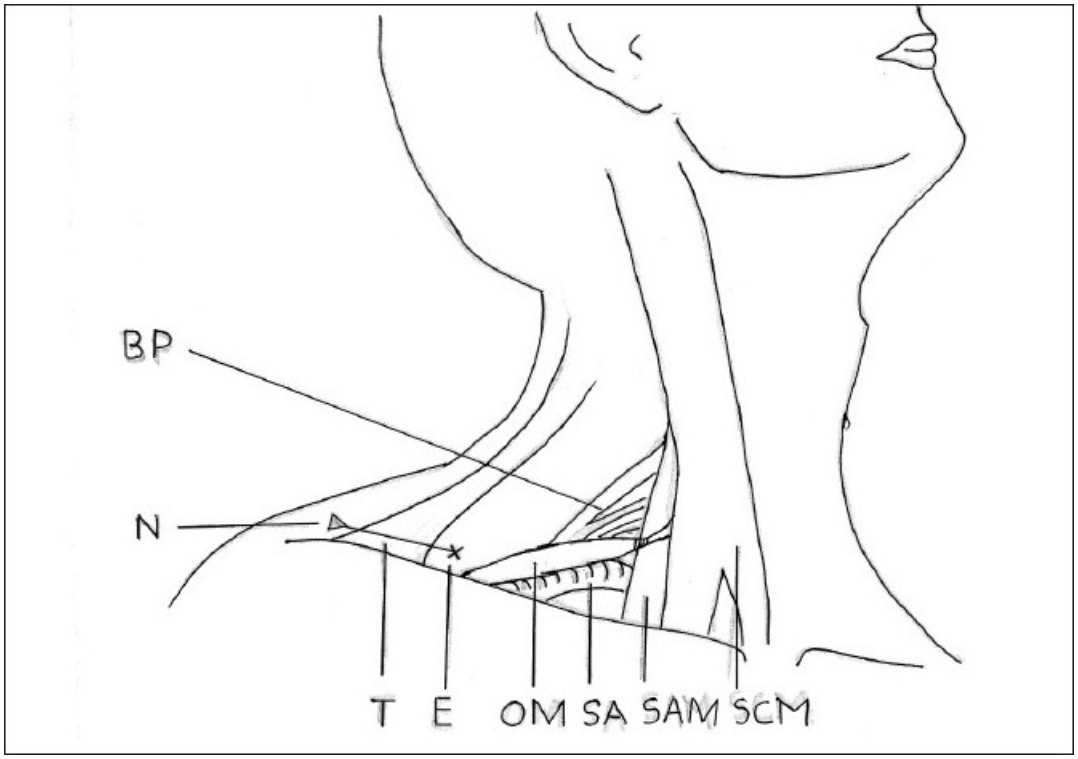
Exclusion criteria

Age < 18 yrs

Pregnancy

SURFACE LAND MARK FOR LATERAL APPROACH





Infection at the puncture site

Coagulopathy

Allergy to amide local anaesthetics

Psychiatric illness

Group I and II–15 ml of 2 % lignocaine with 15ml of 0.5% bupivacaine & 5µgm/ ml of adrenaline

Standard monitoring – BP/Pulse/SpO_2

Sterile towels and 4x4 gauge packs

20ml syringe with local anaesthetics

Sterile gloves, marking pens, and surface electrodes

25G needle for skin infiltration

A 10cm long, short bevel, insulated nerve stimulating needle

Peripheral nerve stimulator

Standard monitoring was applied, an IV line was secured.

TECHNIQUE

Group: I – LATERAL APPROACH

The patient was made to lie supine with head turned to opposite side and arm pulled down gently, A small pillow or folded sheet was placed below the shoulder at interscapular area to make the field more prominent.

LATERAL APPROACH

The insertion point for this Lateral approach is 1 cm above the clavicle at a junction of inner $2/3^{rd}$ and outer $1/3^{rd}$ of the clavicle. The point is about 1 cm medial to border of trapazius muscle. The path is behind the omohyoid muscle and parallel to clavicle in the inter scalene plane between anterior scalene and medial scalene muscle. The omohyoid muscle can be identified by rolling the index finger in the posterior triangle of the neck in normal built patients though it is not obvious in all patients.

After skin disinfection and sterile covering, an intradermal wheal was raised with 1% lignocanine at the entry point, with anesthesiologist standing at the head end, slightly toward the side, Stimulation cannula was inserted through the wheal directed medially and towards the plane of the interscalene space at an angle of 20^0 to the skin, parallel to clavicle deep to the external jugular vein. Contraction of the forearm muscles or biceps was obtained at an electrical intensity of 0.4 – 0.6mA, If stimulation does not appear and rib is contacted, the needle is walked off anterior.

Once the nerve plexus is located, an assistant administered a mixture of 15ml of 2% lignocaine and 15ml of 0.5% bupivacaine with adrenaline 150µgm, slowly after negative aspiration, all the patients had pressure

SUBCLAVIAN PERIVASCULAR APPROACH

paraesthesia during drug deposition. A gentle pressure at the area was given to make uniform spread. All the patients were given inj. Midazolam 1mg and inj. Pentazocine 30mg IV for sedation after successful block.

Group: II – SUBCLAVIAN PERIVASCULAR TECHNIQUE

POSITION OF THE PATIENT

Patient is placed in a supine position with the head turned to opposite side from the side to be blocked. The arm is pushed down to depress the clavicle.

Approach

Patient is placed in a supine position with the head turned to opposite side from the side to be blocked. The arm is pushed down to depress the clavicle. The posterior border of sternocleidomastoid is felt, by asking the patient to raise the head while keeping the head turned to opposite side. The interscalene groove should be located behind the midpoint of the posterior border of the muscle. The anterior and middle scalene can be make prominent by asking the patient to inspire vigorously. Approximately 1cm above the midpoint of the clavicle the pulsation of the Subcalavian artery can be felt in the interscalene groove.

Stand to the side of the patient, on the right side interscalene groove is palpated with the left index finger and the needle is inserted with the

right hand. After aseptic measures and intradermal wheel, a short beveled 4 cm needle is inserted in the marked point. Subclavian artery is guarded with thumb, the needle is directed caudally, posteriorly and slightly medially. Needle enters the fascial sheath 1-2 cm deep to the skin approximately. Nerve block was performed by using a nerve stimulator (stimulation frequency was 2 Hz, stimulation intensity was decreased to < 0.6 MA after each muscular twitch.

Anaesthetic volume was equally divided among arm flexion, as on extension, wrist flexion and thumb adduction). The needle is held firmly and then the local anaesthetic solution is injected after careful aspiration to exclude intravascular placement. To encourage the spread proximally, digital pressure distal to the needle point may be used and digital pressure proximally to needle insertion point may help to encourage distal spread.

PARAMETERS OBSERVED

1. **Mean time to perform block** (from the time of skin disinfection to the end of injection.
2. **Number of attempts.**
3. **Tournique tolerance & duration**

4. **Successful block** – defined as analgesia in the all nerves. (musculocutaneous, median, ulnar, radial and medial cutaneous nerve of the forearm).
5. **Onset of Sensory block** – Onset of Sensory block was taken as abolition of touch sensation over the distribution of ulnar and median and was assessed every minute after the performance of the block.
6. **Onset of motor block** – Onset of motor blockade was assessed every 2 minute after the block using four point scale
    i. Normal power
    ii. Weakness but able to move arm
    iii. Not able to move arm but the fingers
    iv. Complete motor Blockade

    Attaining a score of 2 was considered as the onset of motor Block
7. **Duration of motor Blockade** – When (3) in the four point scale changes to (2) the motor blockade is said to be reversed. The duration of motor block in noted from the time from scale (3) to Scale (2)
8. **Duration of sensory blockade** – The pain was assessed using visual Analogue scale having 10cm length numbered from 0 to 10. Patient was explained about the visual Analogue scale as 0 – No pain and 10 the worst possible pain and was asked the score in visual analogue scale.

The patient was observed every 30 minutes after the surgery is over till the motor block reverses and thereafter hourly for 6hrs; second hourly for next 6hrs and then at 24 hours.

9. Vital parameters

Pulse rate

Blood pressure

Respiratory rate

Oxygen saturation monitored periodically

10**. Complications**

Pneumothrax, Accidental vessel puncture.

DATA ANALYSIS

The information collected regarding all the selected cases were recorded in a Master Chart. Data analysis was done with the help of computer using **Epidemiological Information Package (EPI 2010)** developed by Centre for Disease Control, Atlanta.

Using this software range, frequencies, percentages, means, standard deviations, chi square and 'p' values were calculated. Kruskul Wallis chi-square test was used to test the significance of difference between quantitative variables and Yate's chi square test for qualitative variables. A 'p' value less than 0.05 is taken to denote significant relationship.

OBSERVATION AND RESULTS

This study comprised of two groups. Group–I:30 patients were received Lateral approach of supraclavicular brachial plexus block. Group–II:30patients were received subclavian perivascular approach.

Table: 1 – Age Distribution

Age group	Lateral approach group		Perivascular approach	
	No	%	No	%
Upto 20 years	3	10	3	10
21-30 years	8	26.7	9	30
31-40 years	10	33.3	4	13.3
> 40 years	9	30	14	46.7
Total	30	100	30	100
Range	18-65 years		18-50 years	
Mean	35.4 years		36.6 years	
SD	10.8 years		11.6 years	
'p'	0.5385 Not significant			

Age distribution in Lateral approach varies from18years to 65 years, with a mean value of 35.4 and standard deviation of 10.8. Subclavian perivascular approach varies 18years to 50years with mean value of 36.6 and standard deviation of 11.6. On comparing the both groups, the difference was not statistically significant (p = 0.5385).

(as shown table 1 & figure 1).

MEAN AGE

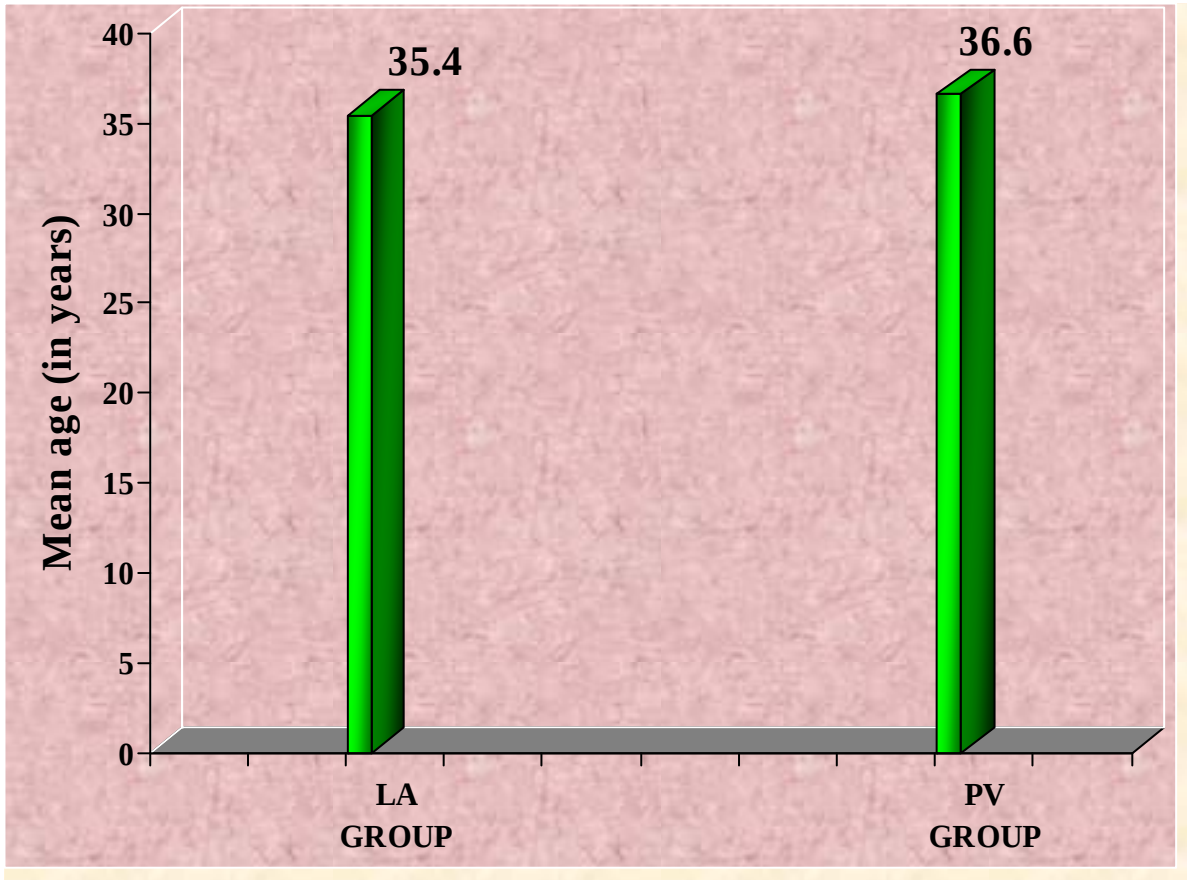

40
35
30
25
20
15
10
5
0
Mean age (in years)
35.4
36.6
LA
GROUP
PV
GROUP

Table: 2 – Sex Distribution

Sex	Lateral approach group		Perivascular approach	
	No	**%**	**No**	**%**
Male	18	60	24	80
Female	12	40	6	20
Total	30	100	30	100
'p'	0.159 Not significant			

Sex distribution in Lateral approach, males were 18, and the rest were females and subclavian perivascular approach, males were 24, and the rest were females. (As shown in table.2 & figure 2).

SEX DISTRIBUTION

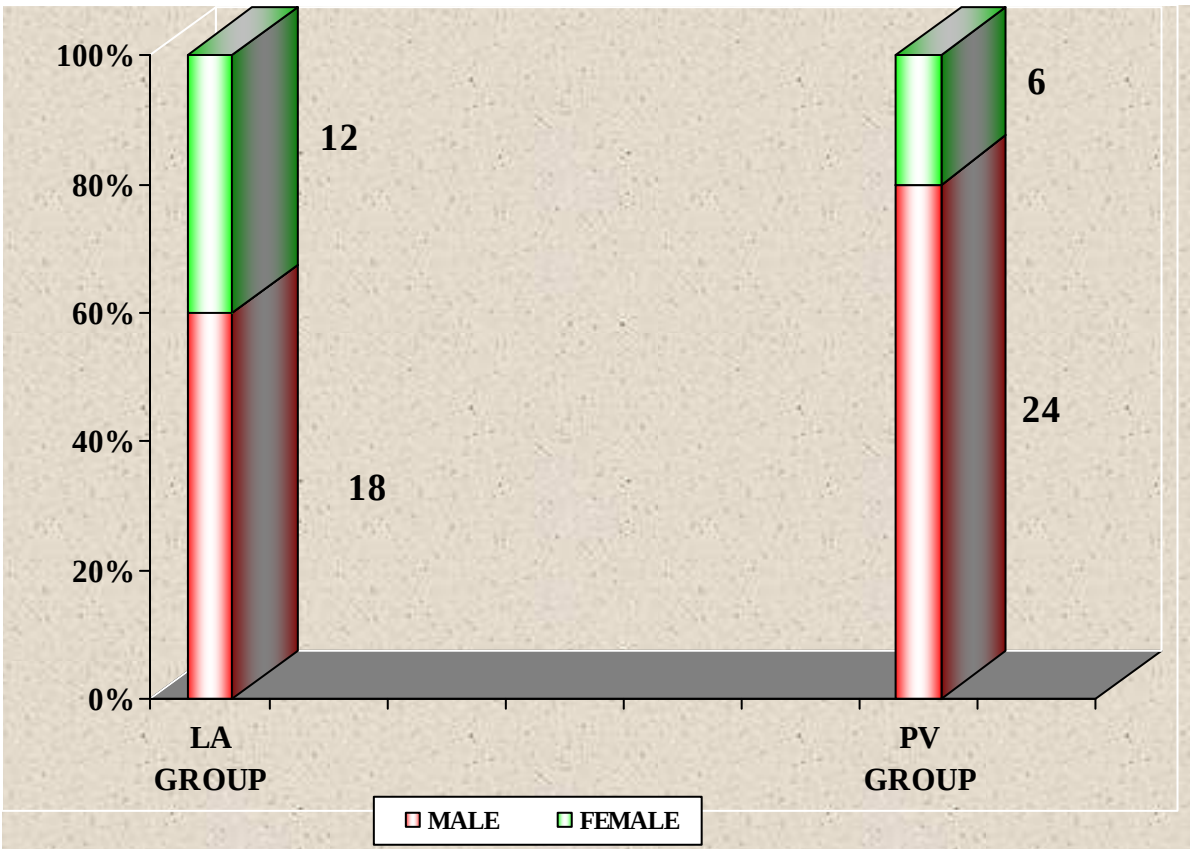


Table: 3 – Weight

Parameter	Weight (in kg)	
	Lateral approach group	**Perivascular approach**
Range	42-68	45-68
Mean	57.1	59.4
SD	7.0	6.3
'p'	0.1693 Not significant	

Weight distribution in Lateral approach, range from minimum of 42kg to maximum of 68kg, with a mean of 57.1, and the standard deviation of 7. In subclavian perivascular approach, weight of the patients ranges from 45 – 68kg, with a mean of 59.4, and the standard deviation of 6.3. (As shown in table.3 & figure 3).

WEIGHT

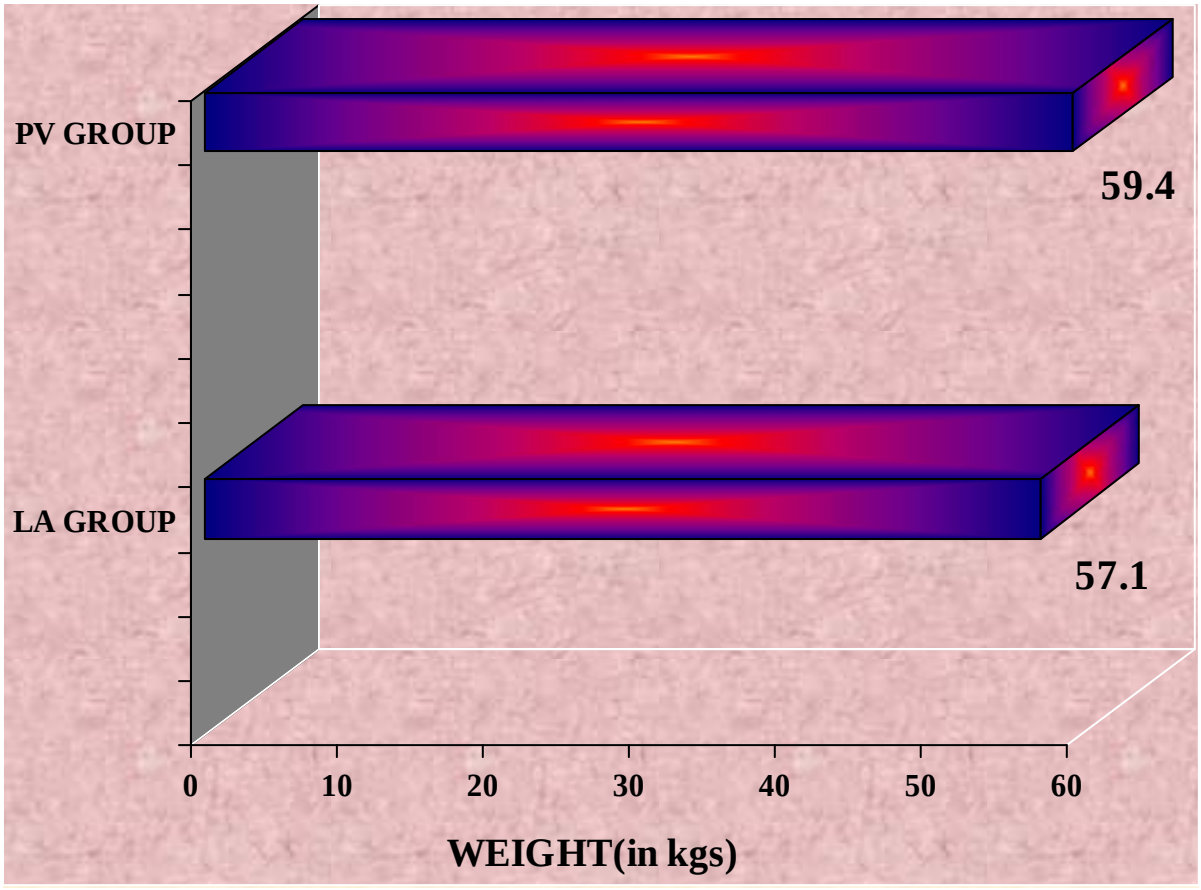
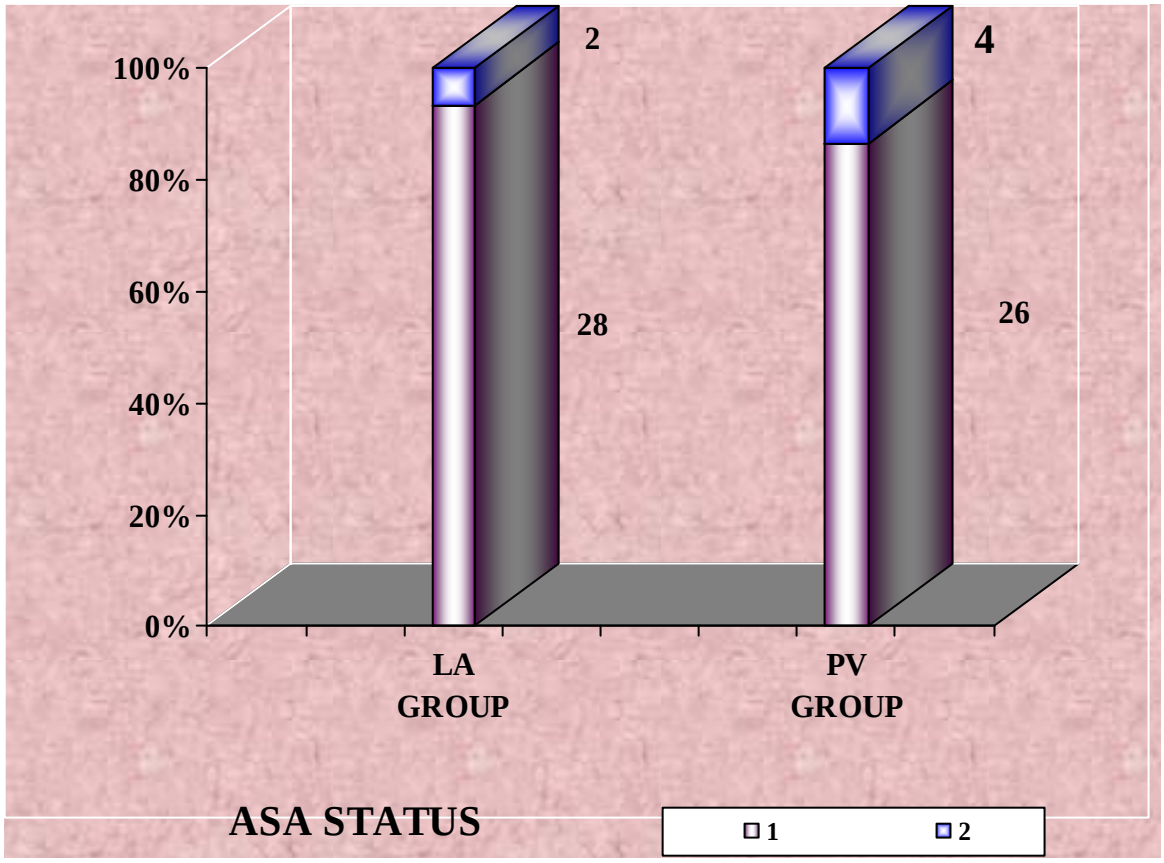


Table: 4 – ASA status

ASA status	Lateral approach group		Perivascular approach	
	No	**%**	**No**	**%**
1	28	93.3	26	86.7
2	2	6.7	4	13.3
'p'	0.3354 Not significant			

ASA status of both the groups did not exhibit any significant difference (p = 0.3354). (As shown in table.4 & figure 4).

ASA STATUS



B: EFFICACY OF THE TWO APPROACHES

Table: 5 – Number of Attempts

Number of attempts	Lateral approach group		Perivascular approach	
	No	**%**	**No**	**%**
1	20	66.7	2	6.7
2	8	26.7	18	60
3	2	6.7	8	26.7
4	-	-	2	6.7
Total	30	100	30	100
Range	1 – 3		1 – 4	
Mean	1.4		2.33	
SD	0.62		0.71	
'p'	0.0001 Significant			

Number of attempts in Lateral approach range from 1 to 3 attempts mean value of 1.4 and standard deviation of 0.62.

Subclavian perivascular approach range from 1 to 4 attempts mean value of 2.33 and standard deviation of 0.71. On comparing both groups, The difference was statistically significant (p = 0.0001).

(As shown in table.5 & figure 5).

NUMBER OF ATTEMPTS

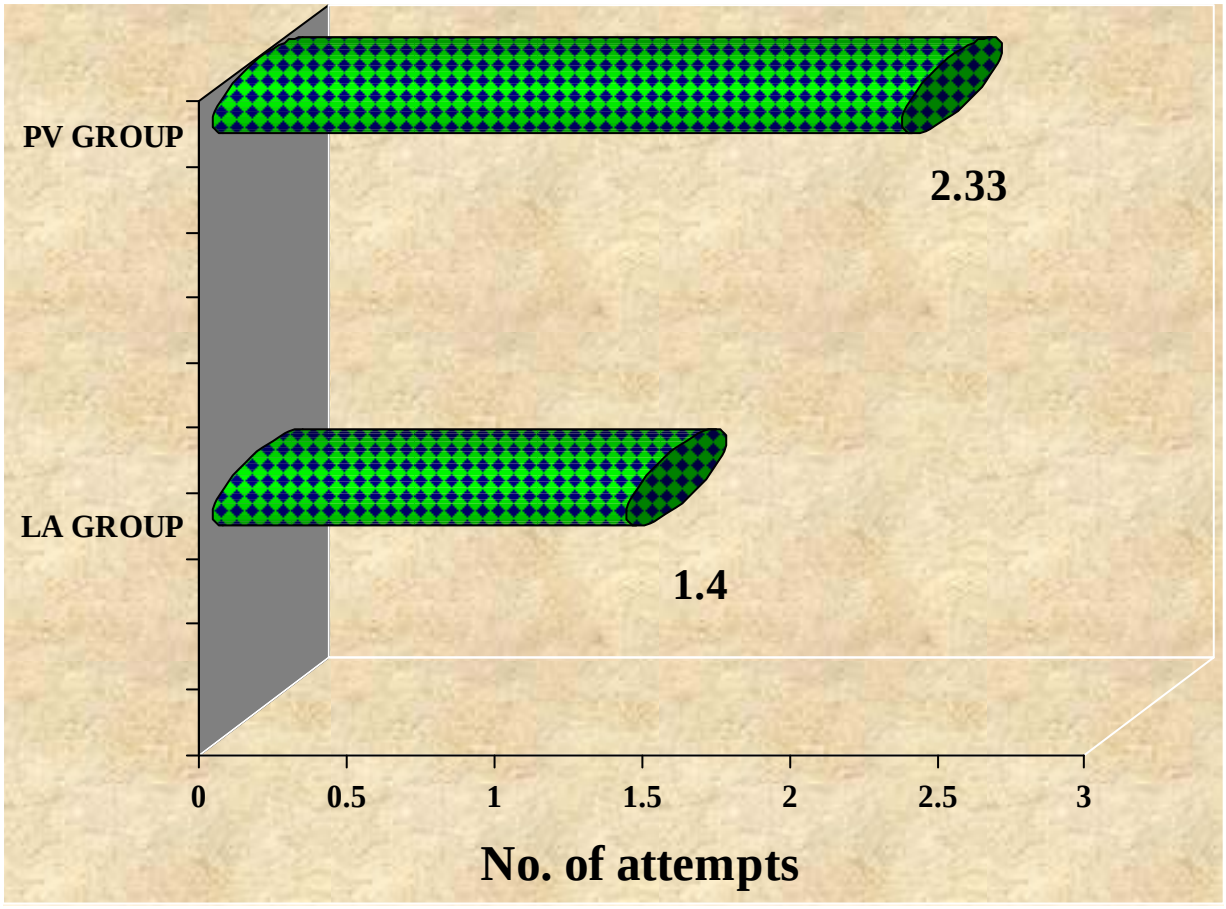


Table: 6 – Time to Perform Block

Parameter	Time to perform block (in minutes)	
	Lateral approach group	**Perivascular approach**
Range	2 – 5	3 – 6
Mean	2.9	4.7
SD	0.84	0.92
'p'	0.0001 Significant	

Time to perform block in Lateral approach range from minimum 2 minutes to maximum 5 minutes with mean of 2.9 and standard deviation of 0.84.

In subclavian perivascular approach range from 3 minutes to maximum 6 minutes with the mean of 4.7 and standard deviation of 0.92. On comparing both groups, the difference was statistically significant ($p = 0.0001$).

(As shown in table.6 & figure 6).

TIME TO PERFORM BLOCK

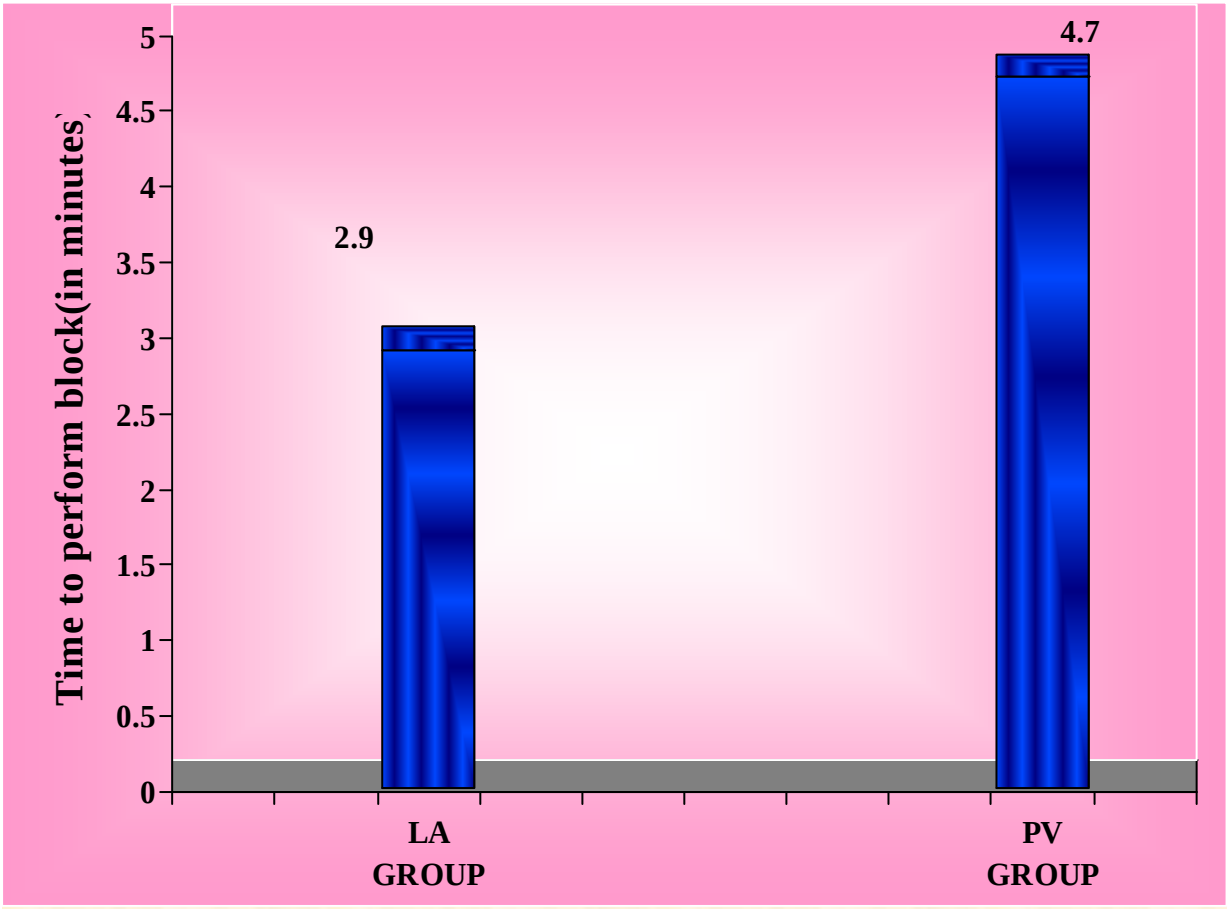


Table: 7 – Time for onset of Sensory Block

Parameter	Time for onset of sensory block (in minutes)	
	Lateral approach group	**Perivascular approach**
Range	4-9	4-9
Mean	6.2	6.13
SD	1.42	1.28
'p'	0.8915 Not significant	

Time for onset of sensory block in Lateral approach ranges from minimum 4 minutes to maximum 9 minutes with mean value of 6.2 and standard deviation of 1.42.

In subclavian perivascular approach range from minimum 4 minutes to maximum 9 minutes with the mean value of 6.13 and standard deviation of 1.28.

There was no significant difference ($p = 0.8915$).

(As shown in table.7 & figure 7).

TIME FOR ONSET OF SENSORY BLOCK

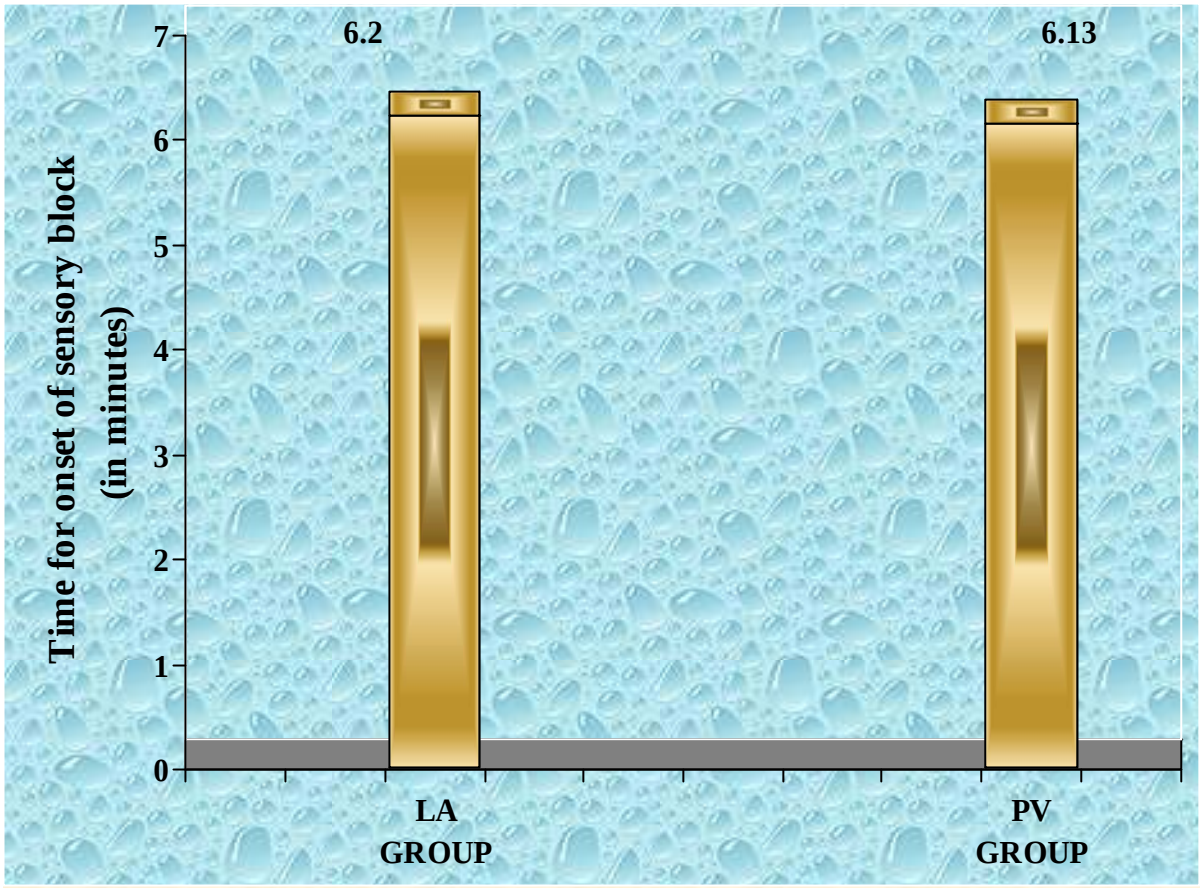


Table: 8 – Time for onset of Motor Block

Parameter	Time for onset of motor block (in minutes)	
	Lateral approach group	**Perivascular approach**
Range	9-15	10-15
Mean	11.93	11.87
SD	1.78	1.68
'p'	0.8801 Not significant	

Time for onset of motor block in Lateral approach ranges from minimum 9 minutes to maximum 15 minutes with mean value of 11.93 and standard deviation of 1.78.

In subclavian perivascular approach range from minimum 10 minutes to maximum 15 minutes with the mean value of 11.87 and standard deviation of 1.68.

There was no significant difference (p = 0.8801).

(As shown in table. 8 & figure 8).

TIME FOR ONSET OF MOTOR BLOCK

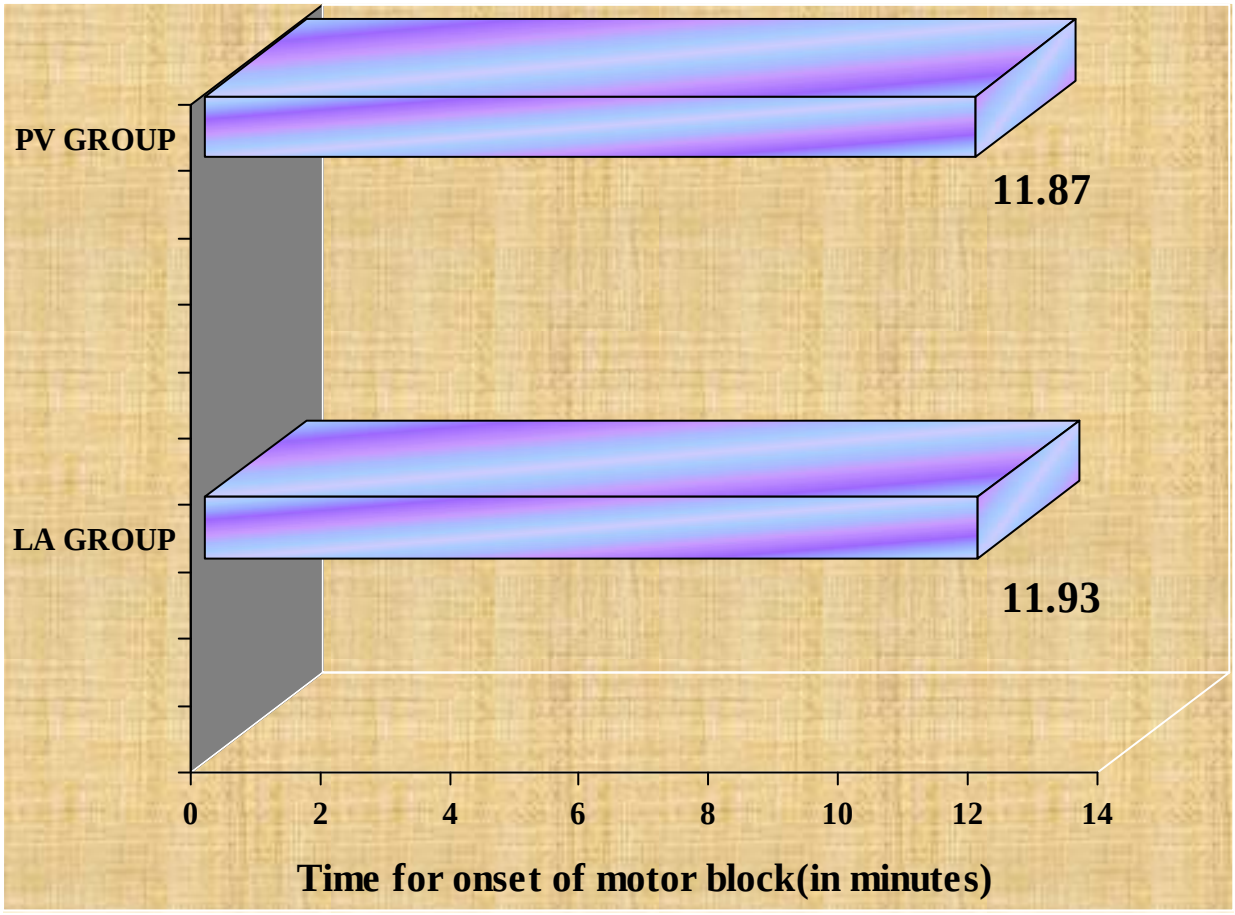


Table: 9 – Duration of Sensory Block

Parameter	Duration of sensory block (in hours)	
	Lateral approach group	**Perivascular approach**
Range	5-10	5-10
Mean	7.67	7.6
SD	1.54	1.54
'p'	0.861 Not significant	

Time for duration of sensory block in Lateral approach ranges from minimum 5 hours to maximum 10 hours with mean value of 7.67 and standard deviation of 1.54.

In subclavian perivascular approach range from minimum 5 hours to maximum 10 hours with the mean value of 7.6 and standard deviation of 1.54.

There was no significant difference (p = 0.861).

(As shown in table. 9 & figure 9).

DURATION OF SENSORY BLOCK

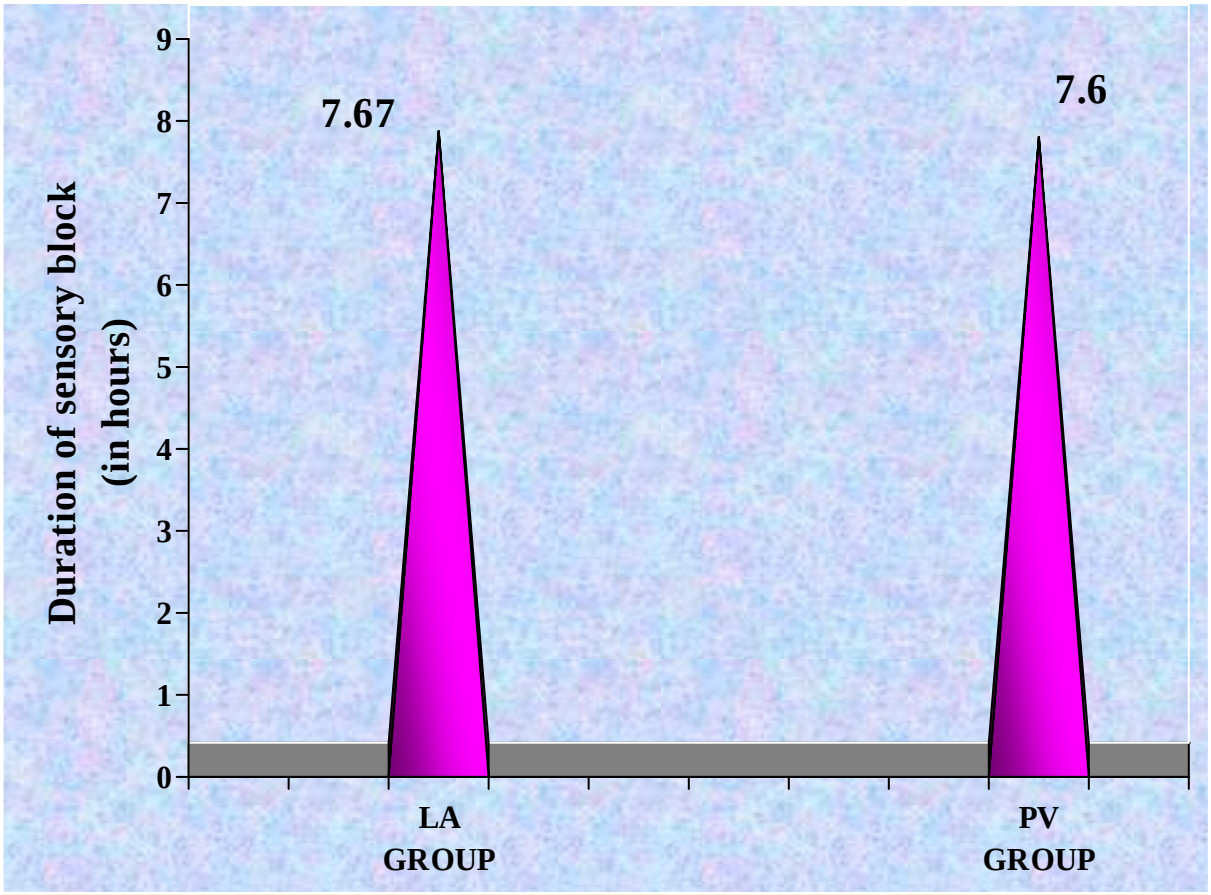


Table: 10 – Duration of Motor Block

Parameter	Duration of motor block (in hours)	
	Lateral approach group	**Perivascular approach**
Range	1.45 – 3	1.3 -3
Mean	2.33	2.34
SD	0.49	0.5
'p'	0.9255 Not significant	

Time for duration of motor block in Lateral approach ranges from minimum 1.45 hours to maximum 3 hours with mean value of 2.33 and standard deviation of 0.49.

In subclavian perivascular approach range from minimum 1.3 hours to maximum 3 hours with the mean value of 2.34 and standard deviation of 0.5

There was no significant difference (p = 0.9255).

(As shown in table.10 & figure 10).

DURATION OF MOTOR BLOCK

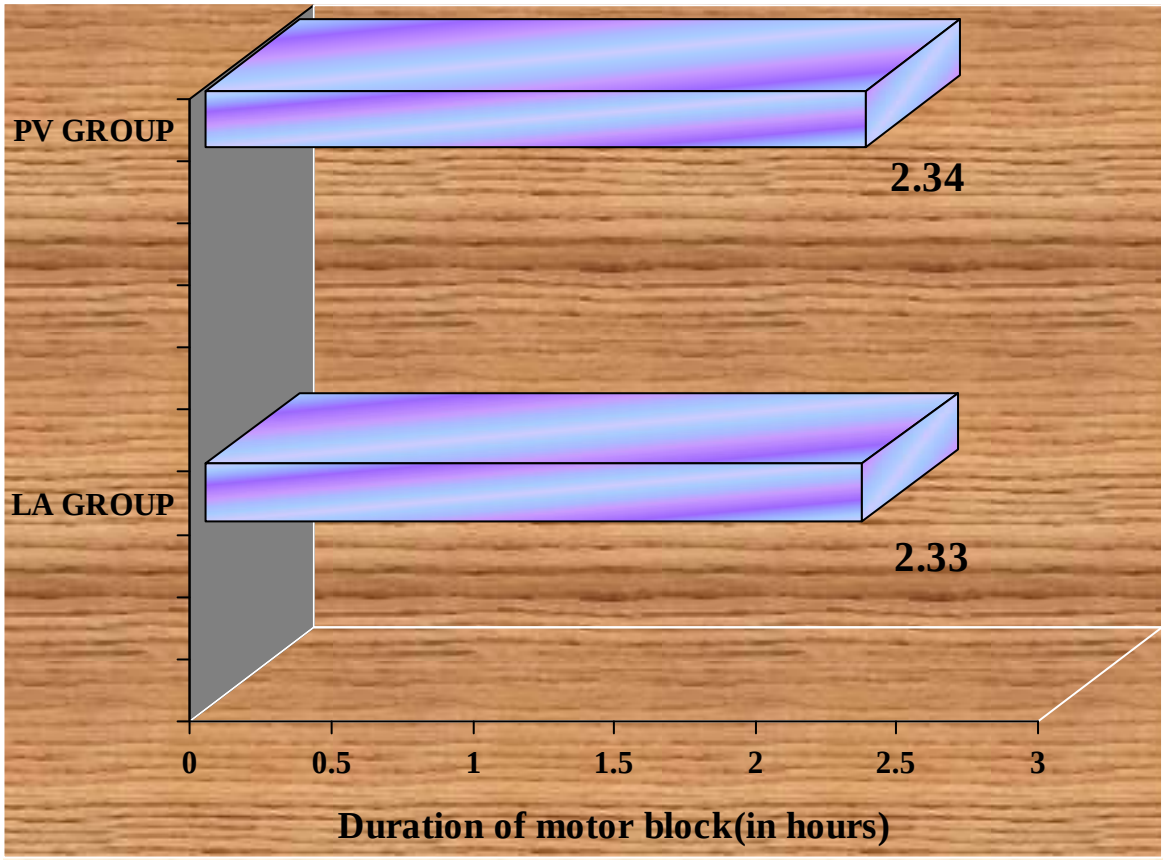


Table: 11 – Tourniquet Tolerance

Tourniquet tolerance	Lateral approach group		Perivascular approach	
	No	**%**	**No**	**%**
Good	29	96.7	23	76.7
Fair	1	3.3	7	23.3
'p'	0.0262 Significant			

Tourniquet tolerance in Lateral approach was good in 29 patients with 96.7% success rate where as in subclavian perivascular approach tourniquet tolerance was good in 23 patients with 76.7% success rate and fair in 7 patients % of 23.3. The difference was significant (p = 0.0262). (As shown in table.11 & figure 11).

TORNIQUET TOLERANCE

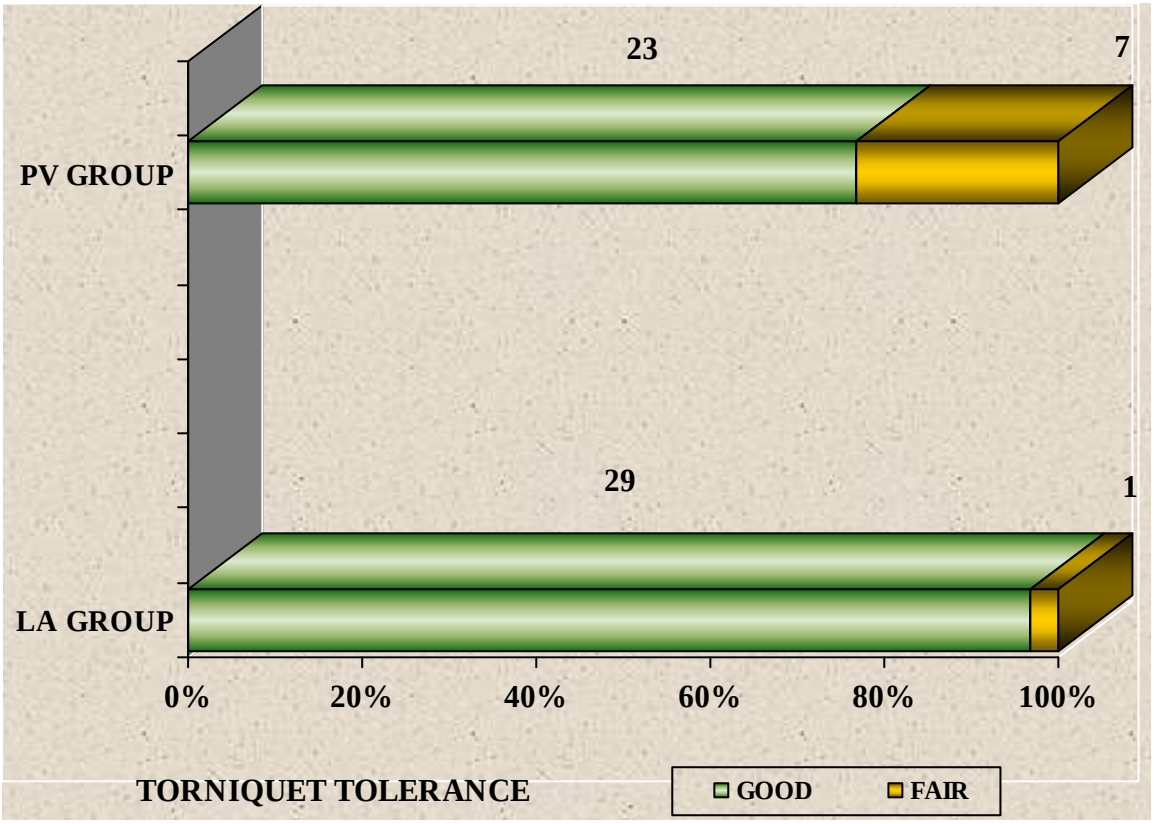


Table: 12 – Success of Procedure

Success of procedure	Lateral approach group		Perivascular approach	
	No	**%**	**No**	**%**
Complete	28	93.3	21	70
Partial	2	6.7	9	30
'p'	0.0453 Significant			

The procedure was more successful in the Lateral approach 93.3% compared with 70% of the subclavian perivascular approach group. The difference was statistically significant (p = 0.0453).

(As shown in table.12 & figure 12).

SUCCESS OF PROCEDURE

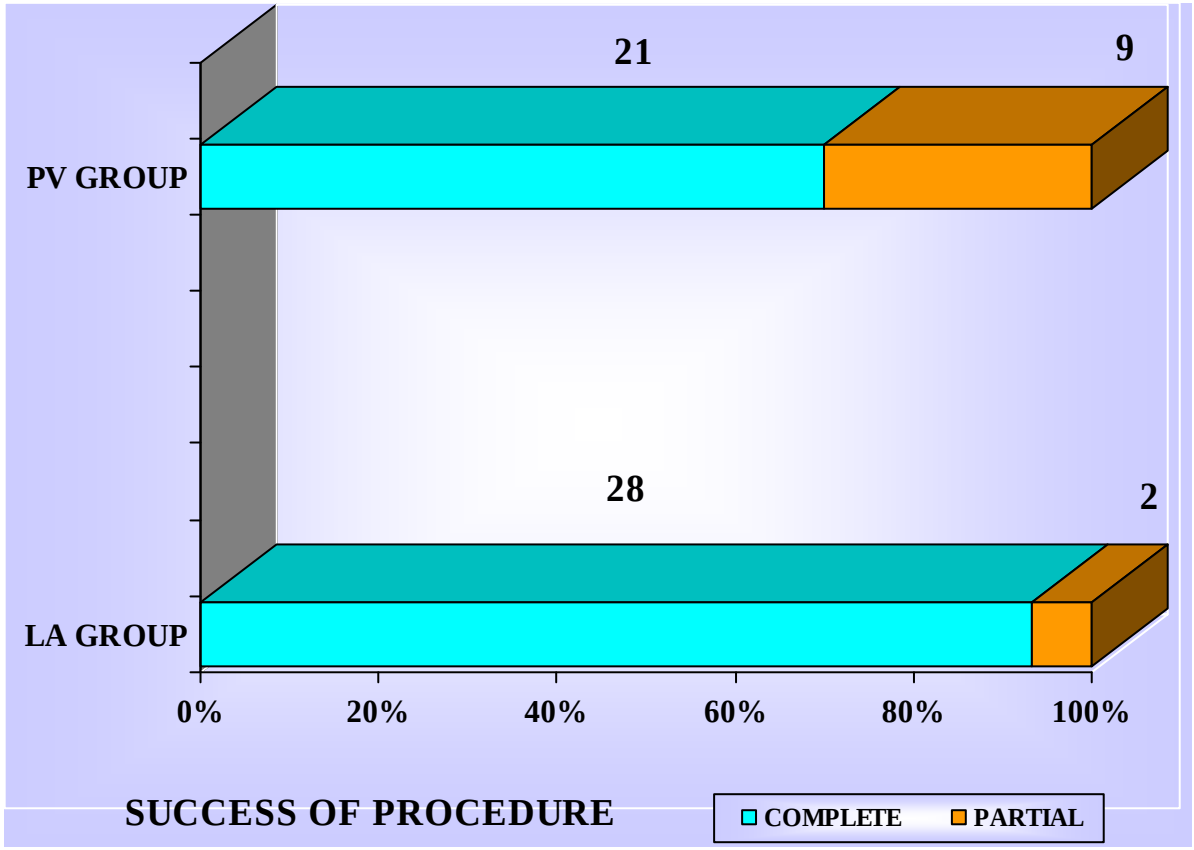
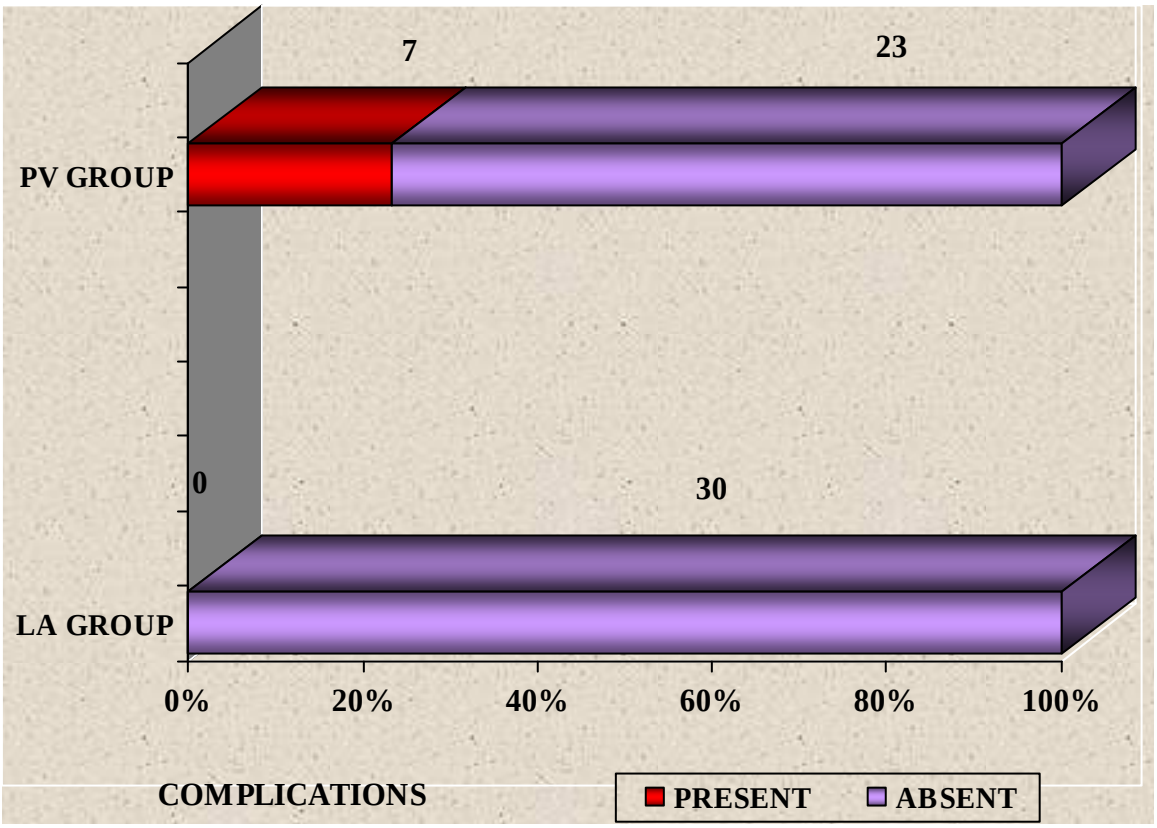


Table: 13 – Complications

Complications Vessel injury	**Lateral approach group**		**Perivascular approach**	
	No	**%**	**No**	**%**
Present	-	-	7	23.3
Absent	30	100	23	76.7
'p'	0.0053 Significant			

No complications in the Lateral approach. In subclavian perivascular approach 7/30 (23.3%) cases of vessel injury. This difference was statistically significant (p = 0.0053).

COMPLICATIONS



DISCUSSION

Brachial plexus block, like any other regional anesthetic techniques offers specific advantage to the patients, surgeon and anesthesiologist. In this technique anesthesia is limited to a restricted portion of the body on which the surgery will be performed, leaving other vital centers unaffected.

Patients who present for surgery with an upper extremity at risk of vascular compromise may improve as soon as pain has been relieved and vasodilatation has been produced by the block.

Various approaches have been described for brachial plexus blocks, namely, supraclavicular, interscalenous, infraclavicular, axillary and transcalene routes, in search of high success rate and less complications.

Supraclavicular technique is considered to be technically easy, associated with less serious complications but varying success rate. The divisions of the brachial plexus lie posterior, cephalic, and lateral to the subclavian artery, as they course over the first rib offering a consistent and valuable anatomic relationship during placement of supraclavicular blocks. This correlates with the study done by Dr. Dilip Kothari et al.

In Lateral approach, the block is performed where the brachial plexus is presented most compactly at the proximal division or trunk level.

This compactness may explain the most complete and reliable anaesthesia for upper extremity surgery. This correlates with the study done by DK.Sahu et al.

In this Lateral approach, the needle passes from lateral to medial side at an angle of 20^0 to skin and parallel to clavicle. Once the needle meets the nerves of brachial plexus, it stimulates muscles contractions or elicits paraesthesia and then reaches to the other structures, hence chances of cervical and thoracic epidural blockade, total spinal anaesthesia, inadvertent injection into the vertebral artery, Horner syndrome and an incidence of recurrent laryngeal nerve blockade are very remote. This correlates with the study done by DK.Sahu et al.

In lateral approach, placing needle parallel to the course of brachial plexus and near the most compact plexus of nerves, results in higher success rate. This correlates with the study done by DK.Sahu et al.

By statistical analysis of two groups the age, sex, weight distribution and ASA status in both groups was statistically not significant with a 'p' value of 0.5385, 0.159, 0.169, 0.335 ($p > 0.05$) respectively.

Time to Perform Block

Time to perform block in Lateral approach range from minimum 2 minutes to maximum 5 minutes with mean of 2.9 and standard

deviation of 0.84. In subclavian perivascular approach range from 3 minutes to maximum 6 minutes with the mean of 4.7 and standard deviation of 0.92. The difference was statistically significant (p = 0.0001**).** Lateral approach relatively easy to perform block. This correlates with the study done by Dr. Dilip Kothari et al.

Number of Attempts

Number of attempts in Lateral approach range from 1to3 attempts mean value of 1.4 and standard deviation of 0.62. In subclavian perivascular approach range from 1 to 4 attempts mean value of 2.33 and standard deviation of 0.71. The difference was statistically significant (p = 0.0001).

Onset to Sensory Blockade

Time for onset of sensory block in Lateral approach ranges from minimum 4 minutes to maximum 9 minutes with mean value of 6.2 and standard deviation of 1.42. In subclavian perivascular approach range from minimum 4 minutes to maximum 9 minutes with the mean value of 6.13 and standard deviation of 1.28. There was no significant difference (p = 0.8915).

Onset of Motor Blockade

Time for onset of motor block in Lateral approach ranges from minimum 9 minutes to maximum 15minutes with mean value of 11.93 and standard deviation of 1.78.

In subclavian perivascular approach range from minimum 10 minutes to maximum 15 minutes with the mean value of 11.87 and standard deviation of 1.68. There was no significant difference ($p = 0.8801$).

Duration of Sensory Block

Time for duration of sensory block in Lateral approach ranges from minimum 5 hours to maximum 10 hours with mean value of 7.67 and standard deviation of 1.54. In subclavian perivascular approach range from minimum 5 hours to maximum 10 hours with the mean value of 7.6 and standard deviation of 1.54. There was no significant difference ($p = 0.861$).

Duration of Motor Block

Time for duration of motor block in Lateral approach ranges from minimum 1.45 hours to maximum 3 hours with mean value of 2.33 and standard deviation of 0.49. In subclavian perivascular approach range from minimum 1.3 hours to maximum 3 hours with the mean value of 2.34 and standard deviation of 0.5 There was no significant difference ($p = 0.9255$).

Tourniqeut Toletrance

Torniquet tolerance in Lateral approach was good in 29 patients with 96.7% success rate where as subclavian perivascular Torniquet tolerance was good in 23 patients with 76.7% success rate and fair in 7 patients % of 23.3. The difference was significant ($p = 0.0262$).

Successful Block

The procedure was completely successful in 93.3% of the lateral approach group and 70% of the perivascular approach group. The difference was statistically significant ($p = 0.0453$). In lateral approach, placing needle parallel to the course of brachial plexus and near the most compact plexus of nerves, results in higher success rate.

Complications

No complications occurred in the lateral approach, where as 7 cases had vessel injury, 7/30 cases (23.3%) in subclavian perivascular approach. This difference was statistically significant ($p=0.0053$). In this Lateral approach, the needle passes from lateral to medial side at an angle of 20^0 to skin and parallel to clavicle. Once the needle meets the nerves of brachial plexus, it stimulates muscles contractions or elicits paraesthesia and then reaches to the other structures, so complications less in lateral approach.

SUMMARY

60 patients of ASA I and II undergoing upper limb surgeries were randomly assigned into two groups, Group I and Group II.

In this prospective randomized study, 30 patients received a supraclavicular block by Lateral approach in group I, and other 30 patients received a subclavian perivascular approach in group II.

Surgeries from below the level of midarm were selected for this study.

Parameters observed were – block performance time, number attempts, onset of sensory and motor blockade, tourniquet tolerance and its quality, duration of sensory & motor blockade and block related complications like pneumothorax, vessel puncture.

Study shows that

1. Time to perform block was shorter in supraclavicular block by lateral approach when compared to subclavian perivascular approach.
2. Number of attempts was less in lateral approach compared with subclavian perivascular approach.
3. Onset of both motor and sensory blockade were same in both groups.
4. Success rate is 93.3% in lateral approach, when compared to subclavian perivascular approach is 70%.

5. Tourniquet tolerance is also good in Lateral approach with success rate of 96.7% when compared to subclaviane perivascular approach 76.7%. So that the tourniquet tolerance and its quality is good in Lateral approach.
6. No complications occurred in the lateral approach, where as 7 cases had vessel injury, 7/30 cases (23.3%) in subclavian perivascular approach. So complication like vessel injury less in lateral approach compared with subclavian perivascular approach.
7. These inferences provide evidence of the supraclavicular block by Lateral approach is a very effective brachial plexus block with distinct advantages.

CONCLUSION

Supraclavicular blockade of the brachial plexus by Lateral approach provides an adequate sensory and motor blockade. It takes less time to perform the block and it reduces the number of attempts. By this approach good tourniquet tolerance, high success rate and less complications will be encountered in comparison to the Subclavian perivascular approach.

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PROFORMA

COMPARISON OF TWO APPROACHES OF SUPRACLAVICULAR BRACHIAL PLEXUS BLOCK FOR UPPER LIMB SURGERIES– LATERAL APPROACH AND SUBCLAVIAN PERIVASCULAR APPROACH

Name : Age: Sex: Date:

Address : IP No: Wt:

Diagnosis :

Surgery :

Technique :

Monitoring :

Time	Pulse	BP	Spo2	Complicatios

- Time to perform block
- Number of attempts
- Onset of sensory block
- Onset of motor block
- Duration of sensory block
- Duration of d motor block
- Tourniquet tolerance
- Success rate
- Complication rate

LATERAL APPROACH

S.No	Group	Name	AGE	SEX	IP NO	Wt in Kg	ASA Status	Diagnosis & Procedure	No of attempts	Time to perform block in mins	onset of Sensory block in Mins.	onset of Motor block in Mins	Duration of sensory block in Hrs.	duration of Motor block in Hrs.	Tourniquet tolerance	Success	Complication
1	1	Vilvadurai	27	M	601809	64	1	Cut injury Rt hand-repair	2	5	4	9	10	3	good	yes	nil
2	1	Alagar	65	M	2624	58	2	Cellulitis Rt UL- W D	1	4	6	12	10	2.3	good	yes	nil
3	1	Deivendran	25	M	5656	65	1	Hand injury -Repair	1	5	5	10	9	2	good	yes	nil
4	1	mallika	45	F	84150	55	1	Raw area left BE stump - SSG	2	4	4	12	8	2	good	yes	nil
5	1	Adaikalaraj	25	M	5296	62	1	Raw area right hand - SSG	1	3	5	14	6	2	good	yes	nil
6	1	Manoharan	48	M	29594	64	1	# BB FA right - ORIF	3	3	6	11	10	3	good	yes	nil
7	1	Rajendran	19	M	37273	54	1	Median nerve cut injury - repair	1	3	5	10	8	2.3	good	yes	nil
8	1	Jayamurugan	32	M	5982	62	1	Flexor tendon injury RT hand - Repair	1	4	7	14	7	2	good	yes	nil
9	1	Selvi	35	F	3584	45	1	*Elbow dislocation LT - ORIF*	2	3	5	15	6	2.3	good	yes	nil
10	1	Vasu	28	M	6984	60	1	# BB FA LT - ORIF	3	2	6	12	8	3	good	yes	nil
11	1	Sundararajan	18	M	3258	58	1	*# supracondylar humerus LT - ORIF*	1	3	8	13	6	2	good	yes	nil
12	1	Indira	36	F	2895	48	1	Extensor tendon injury LT hand - Repair	1	3	7	10	10	3	good	yes	nil
13	1	Duraipandi	42	M	5478	68	1	# SOH LT - ORIF	1	3	9	11	5	1.45	fair	Partial	nil
14	1	Muthulakshmi	38	F	25483	42	1	# SOR LT - ORIF	2	2	6	10	6	2	good	yes	nil
15	1	Subbaih	50	M	5184	62	2	Extensor tendon injury LT hand - Repair	1	3	5	12	7	2.3	good	yes	nil
16	1	Jayamurugan	48	M	3354	56	1	# BB FA LT - ORIF	1	3	7	15	6	2.3	good	yes	nil
17	1	Ranjith	30	M	48621	68	1	*# ulna operated - implant removal*	1	3	8	14	8	3	good	yes	nil
18	1	Murugan	46	M	5481	62	1	Raw area RT FA - SSG	2	2	6	11	7	2	good	yes	nil
19	1	Jayakumar	41	M	3565	58	1	*# olecranon operated - implant removal*	1	3	8	13	6	2	good	yes	nil
20	1	Shanthi	25	F	8451	50	1	Flexor tendon injury RT hand - Repair	1	3	7	10	8	3	good	yes	nil
21	1	Manickam	35	M		60	1	head of 1st MCB RT - k wire fixation	2	2	7	11	6	2	good	yes	nil
22	1	usha	33	F		50	1	Zone IV extensor tendon injury - tendon repair	1	2	5	10	10	3	good	yes	nil
23	1	Radha	35	F		54	1	Crush injury LT F3&4 - WD & k-wire fixation	1	3	4	11	8	2.3	good	yes	nil
24	1	Karthick	20	F		56	1	# olecranon RT - ORIF	2	2	6	10	6	2	good	yes	nil
25	1	Murugan	36	F		55	1	PTC LT finger - contracture release & SSG	1	3	5	14	8	3	good	Partial	nil
26	1	Lakshmi	30	F		48	1	FA cut injury RT - Wound debridement	1	2	8	11	7	1.45	good	yes	nil
27	1	Moorty	50	F		65	1	# lateral condyle & degloving - k-wire fixation	1	2	7	12	10	2	good	yes	nil
28	1	Selvarani	36	F		45	1	# BB forearm - ORIF	2	2	9	15	9	2.3	good	yes	nil
29	1	Murugesan	40	M		62	1	# Radial shaft RT - ORIF	1	2	6	14	8	2	good	yes	nil
30	1	Pandi	24	M		56	1	Raw area RT hand - SSG	1	3	5	12	7	3	good	yes	nil

SUBCLAVIAN PERIVASCULAR APPROACH

31	2	Chinna pandi	50	M	3957	66	1	# olecranon - ORIF	2	6	6	12	8	3	good	yes	nil
32	2	Shanmuga nathan	46	M	2080	60	1	Flexor tendon injury Left hand - repair	3	3	8	13	6	2	good	yes	nil
33	2	Shanthanam	28	M	1129	58	1	Traumatic amputation LT thumb- WD, primary c	2	5	7	10	10	3	good	yes	nil
34	2	Mani	50	M	2188	62	1	# BB FA LT - K wire fixation	2	4	9	11	5	1.45	fair	Partial	nil
35	2	Pandiammal	50	F	2175	64	1	Supracondylar # RT side - ORIF	3	5	6	10	6	2	good	yes	Vessel injury
36	2	Sridhar	25	M	2609	56	1	# BB FA LT - ORIF	1	4	5	12	7	2.3	good	Partial	nil
37	2	Anandhi	19	F	3188	50	1	LT hand injury - Wound debridement	3	6	5	14	6	2	good	yes	Vessel injury
38	2	Subramani	45	M	92356	62	1	# Lateral condyle elbow RT - K wire	2	5	6	11	10	3	fair	Partial	nil
39	2	Perumal	40	M	92533	68	1	Tendon injury LT hand - Repair	4	4	5	10	8	2.3	good	yes	nil
40	2	Mariammal	41	F	93066	45	1	Cut injury RT FA - Tendon repair	3	6	7	14	7	2	good	yes	Vessel injury
41	2	Rajavel	18	M	80	52	1	Extensor tendon injury LT hand - Repair	2	5	5	15	6	2.3	good	yes	nil
42	2	Srinivasan	45	M	3350	58	1	Flexor tendon injury RT hand - Repair	2	4	6	12	10	2.45	fair	Partial	nil
43	2	Pitchai	47	M	3830	64	1	# SOH LT - ORIF	1	5	5	10	9	2	good	yes	nil
44	2	Ramkumar	24	M	5011	60	1	# SOR LT - ORIF	2	6	4	12	8	2	good	yes	nil
45	2	Syed	44	M	5964	68	2	Stump neuroma - Exploration	2	3	7	15	6	2	good	Partial	Vessel injury
46	2	Marimuthu	50	M	5081	58	2	# BB FA LT - ORIF	3	4	8	14	8	3	good	yes	nil
47	2	Muthammal	30	F	3957	62	1	*# ulna operated - implant removal*	2	5	6	11	7	2	good	yes	nil
48	2	Alagar samy	50	M	2624	58	1	Raw area RT FA - SSG	2	6	8	13	6	2	fair	Partial	nil
49	2	Bose	42	M	4489	62	1	*# olecranon operated - implant removal*	3	4	7	10	8	3	good	yes	nil
50	2	Rathinavelmani	22	F	2127	45	1	Flexor tendon injury RT hand - Repair	2	3	5	14	6	2	good	yes	Vessel injury
51	2	Kannan	29	M	6107	64	1	*Elbow dislocation LT - ORIF*	2	5	6	11	10	3	fair	Partial	nil
52	2	Prem	19	M	8243	56	1	# BB FA LT - ORIF	4	5	5	10	8	2.3	good	yes	nil
53	2	Needidevan	40	M	2239	60	2	*# supracondylar humerus LT - ORIF*	2	5	7	14	7	2	good	Partial	Vessel injury
54	2	Sureendaran	21	M	21912	58	1	Extensor tendon injury LT hand - Repair	2	4	6	12	8	3	fair	yes	nil
55	2	Senthil kumar	21	M	52414	60	1	*Non union Montegia # - ORIF*	2	6	8	13	6	2.45	good	yes	nil
56	2	Sanjeev	32	M	84150	68	1	Flexor tendon injury LT hand - Repair	3	5	7	10	10	3	good	yes	nil
57	2	Rakkamal	30	F	5239	48	1	*Non union # SOH - ORIF*	2	4	5	10	6	1.3	fair	Partial	Vessel injury
58	2	Velusamy	50	M	2659	64	2	Extensor tendon injury LT hand - Repair	2	5	4	12	8	2	good	yes	nil
59	2	Gandhi	40	M	5247	66	1	# BB FA LT - ORIF	3	4	6	11	10	3	good	yes	nil
60	2	Rasaih	50	M	9534	60	1	Cut injury RT FA - Tendon repair	2	5	5	10	8	2.3	good	yes	nil

COMPARISON OF TWO APPROACHES OF SUPRACLAVICULAR BRACHIAL PLEXUS BLOCK FOR UPPER LIMB SURGERIES – LATERAL APPROACH AND SUBCLAVIAN PERIVASCULAR APPROACH

ABSTRACT

The supraclavicular brachial plexus can be blocked by various approaches. Aim of this study was to compare two approaches of supraclavicular brachial plexus block- Lateral approach and subclavianperivascular approach. The parameters compared are the quality of blockade, success rate, tourniquet tolerance and complications. This is a prospective randomized study conducted at Government Rajaji Hospital, attached to Madurai Medical College, Madurai. Sixty patients of ASA I & II of either sex undergoing upper limb surgeries (mostly orthopedic, plastic surgeries) were randomly allocated into two groups I and II of 30 each. Surgery was done under Lateral approach in group I and under Subclavian perivascular approach in group II. Both groups given with 15ml of 2 % lignocaine, 15ml of 0.5% bupivacaine & 5mic/ ml of adrenaline. The parameters observed were block performance time, number attempts, onset of sensory and motor blockade, tourniquet tolerance and its quality, duration of sensory & motor blockade, success rate,

and block related complications like pneumothorax, vessel puncture. Finally the study revealed Supraclavicular brachial plexus block by Lateral approach provides an adequate sensory and motor blockade, with less time to perform block, reduced number of attempts, good tourniquet tolerance, high success rate and less complications when compared to subclavian perivascular approach.

Key words: Supraclavicular brachial plexus block, Lateral approach, Subclavian perivascular approach, Peripheral nerve stimulator